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Water centrality for water and society

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Water Centrality
for Water and Society

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Abstract

The current approach to water management in Western societies, including Australia, is based on allocating water between different users. Appropriate for commercial uses, this commodity view of water has proved difficult for the inclusion of environmental and social concerns. Issues, such as which aspects have precedence, how much water should be allocated to each and how to make trade-offs in cases of insufficient water, pose problems that are yet to be worked out. In addition, there is a lack of knowledge regarding the identification of environmental as well as social water needs. The latter has prompted the writing of this thesis.

A closer look at the neglected social water needs reveals the complete permeation of water into all areas of human life, from the basics of survival and health to the ethical and spiritual spheres. All these social aspects, or values, of water, should be integral to water management.

While existing approaches, such as sustainability and integration, were conceived to take into consideration economic, environmental and social elements, their practicalities and implementation are far from being resolved. Both sustainability and integration have definitional issues leading to misinterpretation or lack of guidance. Existing approaches are also hampered by prevalent narrow attitudes and worldview that do not allow equal concern for social issues which, in turn, prevents implementation of universal, consistent water management principles. This is due to inappropriate governance and associated political, structural and operational issues. A different approach may be required to solve the conundrum of water management.

This thesis considers the question: What if water itself were declared the central concern of society?

A 'water central' society could be based on principles derived from sustainability and integration, with water at its heart. *Water Centrality* would need to be implemented throughout society and made part of decision-making from the national governmental level to each person's everyday life. Since it requires fundamental changes to attitudes and worldview the approach will not be easy to implement, but the importance of water and its intuitive appeal should assist the process.

A values-based checklist instrument has been conceived to evaluate existing policies and their implementation for *Water Centrality* compliance and to design new *Water Centrality* compliant policies and initiatives. Suggestions are offered in this thesis of a constitutional level confirmation of the central value/s water has to society and the internalisation of *Water Centrality* in the structure and decision-making processes of all government departments and other organisations. Such endorsement should help facilitate the operationalisation and establishment of a water currency in addition to or in full or partial replacement of monetary value. This currency will foster a new way of thinking about the value of water and its interconnections and provide a broader framework for considering water's value. The framework may need to be reinforced with educational and awareness-raising activities.

While *Water Centrality* cannot be a panacea for all of society's woes, its contribution could be significant in addressing current shortcomings of water management as well as other resource management, governance and social issues. This work explores initiatives and suggests a way forward for *Water Centrality*.

Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

  (i)   incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;

 (ii)   contain any material previously published or written by another person except where due reference is made in the text; or

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All my interviewees have to remain anonymous, but they know who they are and I thank them for taking the time to talk to me and pass on their knowledge and expertise. Although I did not end up using the material in the thesis the information they provided was instrumental in making the thesis what it is.

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Preface

At the outset, the purpose of this thesis was to provide a scholarly solution for a specific problem area of water management. However, when it became clear that the original approach could not achieve its aim of solving the issue due to the narrow frame in which it was set, the natural choice was to broaden the scope of the approach. That this would then lead to a body of work that not only points out some of the flaws and shortcomings of current water management but seriously questions the conventional wisdom and proposes a new way forward was a logical, if not necessarily foreseen or intended, progression.

I realise that shaking the foundations of a long-established field, such as water management, which is based on well-accepted, and often unspoken, rules and tenets, may be perceived in different ways. Therefore it is important to stress that this thesis is not meant to be derogatory or negative. It is meant to be constructive and affirmative, providing ideas for a society that seems in dire need of fundamental change if it is to remain living in a world that is welcoming and habitable for humans and other species in the foreseeable future. That is the reason this thesis also contains elements of a vision or manifesto. *Hubris* may be attributed to such an undertaking, but my intention is to make a real contribution to society rather than self-promotion.

After years of concern and the continuing development of thinking about the environment and humanity's situation, including the preparation of this thesis, I was profoundly struck by a recently read quotation:

> We need a perspective that joins the hard-won victories of civilisation, such as human rights and democracy with a larger view of our place in the cosmos – what Berry calls "the universe story" [Thomas Berry (1999)]. By whatever name, that philosophy must connect us to life, to each other, and to generations to come. It must help us to rise above sectarianism of all kinds and the puffery that puts human interests at a particular time at the centre of all value and meaning. When we get it right, the larger, ecologically informed enlightenment will upset comfortable philosophies that underlie the modern world in the same way that the Enlightenment of the eighteenth century upset medieval hierarchies of church and monarchy. (Orr, 2002 p.4)

While there is no claim that this thesis can facilitate change on the scale of the Enlightenment, it is hoped that the ideas it embodies have the potential to perpetuate a

process of rethinking, which has started already, that may eventually lead to such change. The woes of water management are only part of a bigger, underlying problem in the Western world which I argue requires a 'revolution' in thinking.

The literature published in the last two to three years is an indication that change is occurring. Today there are many more journal articles and books that concentrate on the theme of water and which make connections to water in areas such as human experience, governance, climate change, agriculture, business and industry, energy production, landscape, architecture, etc., many stressing the vital importance of water. This increasing attention to water is encouraging and seems to support the arguments presented in this thesis. However, it also highlights the urgency of making these ideas more widely known to stimulate further discussion and to harness the full potential of this development so as to translate it into meaningful action.

In the writing of this thesis, I was able to fully embrace the freedom of academia, unencumbered by the concerns that a career scientist may be burdened with such as employment or political and other sensitivities. This is not a 'traditional' dissertation in the sense of providing a positivistic, qualitative or empirical study of water management or society. Both scope and language reflect the desire to offer a coherent visionary argument or philosophy that, ultimately, appeals not only to academics but also to a broader audience, including policy makers, politicians, practitioners and other decision makers and interested parties.

In part, the nature of the thesis is due to the nature of the subject matter. Water is so interconnected with all aspects of human life, that a broad-brush method was applied to capture the many elements requiring consideration; sometimes, necessarily, at the expense of depth, detail of investigation or analysis. In addition, water is not only a special, vitally important substance but is closely connected to the emotions. This makes scholarly and 'objective' study not only difficult, but also suggests that without emotional involvement it would remain incomplete. While the subject of gender was hardly touched upon in this body of work my own gender may nevertheless have influenced it; the feminine has been linked to emotions, fluidity and chaos (Rogers & Schutten, 2004).

Generally, intuition, common knowledge, passion and emotions are not easily conveyed in the accepted academic scholarly style, and particularly so if a subject is close to one's heart. As such, this work contains urgency and passion reflected in its

language and expression that may be unusual. It also displays opinion and bias, since it is based on a particular standpoint, which is necessary to make the arguments herein.

Whenever large or significant change is proposed which requires moving minds from one set of beliefs and habits to a new understanding of both the problem and the possible solutions, the power of persuasion is an important consideration. Accessible language will always be important for the message to be articulated. This thesis has achieved its first purpose if it stretches people's thinking, then even more so, if it evokes an emotional response which, ultimately, leads to action.

Chapter 1
Introduction

The initial impetus for writing this thesis came from the introduction of a water policy for environmental allocations in Western Australia that contained a new concept: social water requirements (SWR). This move was welcome because it appeared to align water management in the State with the overall move towards sustainability, in finally taking account of social considerations in water allocation decisions. The idea for this thesis was to examine the concept of SWR with the aim of redressing the lack of means and methods of identifying these requirements, for which the relevant management agency at that time had limited solutions. In addition, the aim was to devise ways of integrating social requirements for water with those of the environment since there was a suspicion that the overlap between the two could be substantial, especially in the case of indigenous cultural values of water.

As the project progressed, the realisation emerged that indeed the overlap between social and environmental aspects was large; so much so, that the notion of separating social, environmental and also economic aspects of water became untenable. It became obvious that not only virtually the whole ecosystem is part of the hydrological cycle (Jewitt, 2002) but also the whole social and economic system (see Chapter 2). Hence, focussing on only one aspect of the water cycle or on a limited set of considerations cannot achieve the ultimate aim of water management[1], which is the maintenance of full water system functionality.

This finding was substantiated by the "three conceptual shifts in ecology – toward a system view, inclusion of humans in the ecosystem, and management by participatory approaches – [which] are related" (Berkes, 2004 p.624). It is also echoed by the growing recognition in resource management[2] that "*social and ecological systems are deeply interconnected*" (Folke, 2007 original emphasis) and that new ways need to be found to deal effectively with this interconnectivity and complexity (Dietz, Ostrom & Stern, 2003).

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[1] In this thesis the term water management (WM) is used in preference over water resource management (WRM) since it is the opinion of the author that water is more than a resource

[2] Resource management and natural resource management (NRM) are used in this thesis for want of better terms while acknowledging that 'natural resources' is a limiting term, not doing the matter justice

To date, the implementation of the underlying idea of sustainability, that is, the integration of the three areas of economy, environment and society, has been varied and relatively unsuccessful, for reasons that are explored in Chapter 3. For similar reasons, integrated water management has met with limited success (details in Chapter 4).

The traditional 'command and control' approaches to water management have been criticised for being inappropriate, and for leading to a reduction of ecosystem variability and associated loss of ecosystem services and system resilience (e.g. Holling & Meffe, 1996). This has prompted much reform activity to redress the existing problems and increase sustainability, integration and adaptation in management. Overall, this has resulted in little change (Briggs, 2003); on the contrary, in some cases problems have been exacerbated (Solanes & Jouravlev, 2006).

In an attempt to reduce conflict caused by growing demand and increased competition for water, much of the reform effort is focussed on water rights, which can be an effective tool in water management in some situations, but only in conjunction with appropriate institutional arrangements (Bruns, Ringler & Meinzen-Dick, 2005). It appears that at least some of the increase in water conflict is actually caused by lack of appropriate governance (Solanes & Jouravlev, 2006).

Such lack of institutional support has been one factor in the limited success of water reform in Australia, which is predominantly market-based (McKay, 2005). McKay (2003) suggests a radical redesign of water governance in Australia, in which the states assert ownership over rainwater in order to devise new regulatory schemes for water allocation combined with an improved knowledge base and removal of administrative inequity[3]. New institutional arrangements are needed to improve community involvement to reduce inequity and lack of inclusiveness while making complexity manageable (McKay, 2003).

These suggestions are echoed by others, based on the realisation that ecological, social and socio-ecological systems are complex and therefore inherently unpredictable,

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[3] Humans have a penchant for justice, trying to work towards outcomes that are just; however, justice is subjective since it is linked to perceptions, values and culture, so what may be just to one individual may not be so to another. The equity theory of distributive justice holds that people are satisfied when outcomes (e.g. wages or allocations) are equitable, i.e. when they receive what they consider to be fair; they resent receiving too little or feel uneasy if they get too much. Since equity and inequity are subjective, justice conflicts may arise even though all parties are using the equity principle (Montada, 2003)

requiring non-linear thinking, complementary use of qualitative and quantitative data as well as multiple perspectives. This method has not been part of traditional water management approaches until now (Berkes, Colding & Folke, 2002). Conventional management also has difficulties with cross-scale issues and non-linearity, which may be addressed through attention to adaptive renewable cycles and associated diversity, ecological as well as social (Berkes et al., 2002). Cross-scale approaches that link institutions horizontally as well as vertically and are planned 'bottom-up' to achieve local solutions are needed to replace centralised management. In addition, enabling legislation, appropriate government institutions and capacity building should be provided that have empowerment and an ethics base at their heart (Berkes, 2004). Essentially, this means that "the age of management is over" (Berkes, 2004 p. 628) and is replaced by one of "participation".

> It is clearly urgent to find new ways and means for improving water use and allocation, if substantial progress is to be made towards the management of water from the long-term, sustainable development perspective. In recent years, one of the responses has been to promote collective *negotiated decision-making procedures*, both nationally and internationally; negotiated decisions can lead to management choices that are better adapted to local conditions, easier to implement, less conflictual, and more stable. Furthermore, negotiated policy making opens up the possibility of participatory planning, which is becoming increasingly important particularly for natural resources. (Carraro, Marchiori & Sgobbi, 2007 p.331)

However, while collective negotiated decision-making seems to be a clear improvement over command-control approaches and also traditional market-based methods (Carraro et al., 2007) water is predominately regarded as a resource. This may be appropriate for dealing with the increasing recognition of the fundamental importance of water for socio-economic development, sustainability, livelihoods, key ecosystems and services (see e.g. Carraro et al., 2007; Falkenmark & the Symposium Scientific Programme Committee, 2005), but it does not seem appropriate for dealing with and acknowledging the unique characteristics of water without which life on Earth would not be possible (e.g. Ball, 2001; Ripl, 2003), as well as the other more intangible aspects of water including the spiritual, cultural and aesthetic. Any approach that focuses only on the utility aspects of water, fails to do justice to its much broader values base (Gibbs, 2006; Syme, Porter, Kington & Goeft, 2004) (see Chapter 2).

Interestingly, most water rights reform seems to have been driven by forces outside the water resources sector, founded in regime change, market and economic

reform as well as environmental concern (Bruns et al., 2005). Hence, "water management problems, both with respect to the resource itself and to water-related public services, neither originate nor can be solved within the confines of water resources alone" (Solanes & Jouravlev, 2006 p. 17). This implies the necessity of a broader approach to water issues that should, as a minimum, include consideration of interactions with macroeconomic and social policies and an ongoing dialogue with those responsible for those policies as well as water users (Solanes & Jouravlev, 2006).

There are examples of emerging adaptive co-management systems (e.g. Folke, 2003 in Sweden) but these are still threatened by incompatible worldviews and lack of social-ecological resilience. While the importance of leaders and stewards in these emerging systems was highlighted (see also Westley, Zimmerman & Quinn Patton, 2006) in addition to a list of significant features (Folke, 2003) (see Chapter 5), the following recognition seems most important:

> Stewardships of freshwater in dynamic landscapes to secure and enhance social and economic development will no doubt be a central issue in the near future. It requires a shift in thinking and management of freshwater as merely a resource to freshwater as the breath of the Earth. It also requires a shift from trying to control and allocate freshwater flows in an optimal manner for various human uses to recognition of the necessity to actively manage the essential role of freshwater in dynamic landscapes faced with uncertainty and surprise. It will require that those involved in freshwater management foster a worldview and vision of stewardship of freshwater as the bloodstream of the biosphere. This broader view of freshwater provides the foundation of hydrosolidarity. (Folke, 2003 p. 2033/4)

Arguably, this insightful conclusion, while profound and radical, still requires broadening. Water is of such importance to all forms of life, all humans and all human endeavours, that the active management of the essential role of freshwater cannot be limited to dynamic landscapes but needs to include all the human elements in that 'landscape'. These include those associated with transport, industry, settlements and other structures[4], as well as the less tangible societal elements of the economy, politics, the arts, culture and spirituality.

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[4] There are many different views of 'landscape' of which earlier versions used in European landscape ecology may have had a holistic and systems approach trying to integrate people and landscapes as 'total human ecosystems'. A full exploration of the concept and its associated theories is beyond the scope of this work, suffice it to say that those versions that include people and their activities and those that realise the fundamental role water plays in shaping landscapes would be most useful for this work. (e.g. Gandy, 2006; Wiens, 2002).

Freshwater is not only the 'bloodstream of the biosphere' but also the anthropogenic world (Falkenmark & Folke, 2002). Thus, it could be considered the 'lifeblood of the socio-ecological sphere'. Since this recognition hints at a host of challenges regarding different considerations and conflicting goals (Falkenmark & Folke, 2002), it should be not only fostered by those directly involved in freshwater management but actively spread, supported, implemented and incorporated throughout society, from the individual to the highest institutional level. Suggestions of how this could be achieved through *Water Centrality* are outlined in Chapters 5 to 8 of this thesis.

In principle, the proposed changes should be applicable and employed worldwide; by necessity, the geopolitical and cultural context of this thesis is 'Western'. Firstly, the author has been raised, culturalised and educated in 'Western' countries and, therefore, can only write with knowledge from such a background, and, secondly, much of the literature concerned with water and water management has been written and published in a similar, that is 'Western', geographic, cultural and political context. While literature and research from the developing world is being used in this thesis, much of that was written by researchers from 'Western' countries or those educated at 'Western' style universities, therefore the context tends to be 'Western' in terms of a market-economic or utilitarian approach to water management.

Ultimately, not only the transferability of the proposed approach to different political, geographic or cultural situations but also its appropriateness and feasibility for Australia and other 'Western' nations will have to be decided outside of this thesis. What is hoped is that the ideas outlined herein will make a useful contribution to the ongoing debate about, and the practice of, water management, as well as people's relationship with water. Ideally, it will lead to a revaluation of water that can help foster changes in society to benefit both the water system and humanity.

Chapter 2
Values and Water

2.1 Values and Water Management

People's relationships with their surroundings are influenced by what they perceive to be important, of which water is one of the most significant elements (Gandy, 2006; Strang, 2005; Ulrich, 1993)[5]. Hence, an inquiry about improving the management of water should examine how and in which ways water is important to people and explore the relationship of society with water.

It is an indisputable fact that water is essential for humans, but it is also an integral part of the environment. Therefore, it seems critical to understand how much the water needs of humans are interrelated with those of the natural environment, in addition to appreciating the effects of human actions on and interactions with water. This interconnectivity is especially obvious in indigenous cultures (Davis & Kirke, 1991; National Science Foundation, n.d.; Phiri, 2000; Stone, 2002; Strang, 2005) but a closer look shows this also to be the case for the rest of humanity when all indirect uses of water are taken into consideration (Emerton & Bos, 2004; Falkenmark, 2003a; Postel & Richter, 2003; Ripl, 2003; Wallace, Acreman & Sullivan, 2003) or when our thorough dependence on water as the giver of life (Bartholomew, 2003) or the mediator of all life processes is considered (Ball, 2001; Marrin, 2002).

In the 1998 Stockholm Water Symposium proceedings water has been recognised as the "major limiting factor in the socio-economic development of the world" (SIWI, 1998 p.9). However, it was only recently that the role of water in development and all aspects of human life have been acknowledged, recognising at the same time that general awareness of this role is inadequate (Falkenmark & the Symposium Scientific Programme Committee, 2005).

This lack of awareness may be connected to the general neglect of social considerations in WM so far (Wallace et al., 2003). For example, there are still millions of people without basic, clean and safe supplies of water despite obligations recognised

by governments in the form of resolutions, declared goals and other commitments (Gleick, 2002; UNEP Millennium Ecosystem Assessment, 2005; Wallace et al., 2003). Although some attempts at including social aspects in WM are occurring, for example through legislative changes in South Africa or water policy reform in Australia and Brazil, most of these are hampered by a lack of capacity and governance which is, essentially, due to a lack of political will associated with a worldview based on values dominated by economic concerns (see Chapters 3 and 4).

> … the concept of values, more than any other, is the core concept across all the social sciences. It is the main dependent variable in the study of culture, society and personality, and the main independent variable in the study of social attitudes and behaviour. It is difficult for me to conceive of any problem social scientists might be interested in that would not deeply implicate human values. (Rokeach, 1973 preface)

This can, at least to some degree, be extended to natural resource management (NRM), where the importance of information about values has been recognised as helping researchers and managers to better understand public needs and enable appropriate responses (Tyler, Vining, Dorsey & Larson, 1995). The presence of emotions that often accompany deeply-held values can also be a key to understanding public concern (Tyler et al., 1995). In addition, values are related to policy since "public policies are statements of normative social values" (Zube, 1984 p. 6).

> One way to approach the question: what functions do values serve? is to think of values as standards that guide ongoing activities, and of value systems as general plans employed to resolve conflicts and to make decisions. Another way is to think of values as giving expression to human needs. (Rokeach, 1973 p.12)

The nature of values and the breadth of their influence make them fundamentally important for successful water management. Since it seems that they have been neglected along with other social considerations, addressing this shortcoming should start by finding out what the values of water are. Before an attempt can be made to identify a full set of water values to support successful WM, clarification of some underlying issues may be required. Much confusion is apparent regarding the term 'values' and its uses in NRM and WM, warranting a more detailed look at the term, its definition and use.

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[5] Ulrich (1993) explained this through an evolutionary perspective. Water, food supply and shelter as the basics of survival were essential in determining where people chose to settle in ancient times, still influencing human preferences, perceptions and wellbeing today.

The aims of this chapter are:

- to clarify the concept of values and their role in water management;
- to identify the values of water; and
- to clarify the role of water values in water management and society.

2.1.1 Values

The term 'values', is used in many different ways and contexts (Reser & Bentrupperbäumer, 2005). Here, values are explored in their original social sciences context, which describe 'values' as theoretical human constructs considered to be particularly important, together with attitudes and perceptions, in influencing behaviour (Reser & Bentrupperbäumer, 2001; Rokeach, 1973). The concept of values is an "abstract frame of reference encompassing beliefs, thoughts, feelings, and attitudes that influence judgements, setting of goals, identification of needs, and discrimination among competing demands" (Zube, 1984 p. 3).

> Values were and are viewed, from this social science and rather 'social psychological' perspective as individually and culturally held beliefs, positions, or evaluative stances with respect to what is important, what is 'good' and 'bad', what 'has value' for human society, individual well being, and the world as a whole. Values, as distinct from other beliefs and attitudes, have been conceptualized and understood as more fundamental and enduring convictions, typically operating as a 'system', having strong emotional and/or moral overtones, and as providing the foundation for shared world views, social and moral orders, and ethical, justice, and legislative considerations, for example, values respecting human rights (e.g., Rokeach, 1973, 1979; Azjen, 1991; Eagly & Chaiken, 1993). (Reser & Bentrupperbäumer, 2005 p.129)

The following overview of some definitions of values may give an indication of the complexity of the subject. It is apparent that a long, unresolved battle is being fought over the ideas that values refer to something that is valued, i.e. qualities that objects possess (inherently or ascribed), or to internal (individual) standards that guide behaviour (Adler 1956 cited in Reser & Bentrupperbäumer, 2005; Rokeach, 1973; Tyler et al., 1995). Relating to the first category, some authors recognise three types of value: "A – things valuable to themselves; B – things valuable in themselves (i.e. intrinsically) to us; and C – things valuable only instrumentally to us" (Attfield & Dell, 1996 p. 39).

Other authors ascribe a clear preference component to values, which is differentiated from social obligation or biophysical function (Brown 1984 cited in Manning, Valliere & Minteer, 1999 p. 422), while such preferences have a shared

component and refer to life outcomes and types of conduct in another definition (Ball-Rokeach and Loges 1992 cited in 1999). A contrasting, and possibly broader, view recognises three different forms of value relationships - preferences, obligations and functions. 'Preference' expresses a relationship of desire and predilection; 'obligation' refers to a relationship of social norms or expectations, which can go against personal preferences (also called moral imperatives or absolutes), and 'function' describes relationships of usefulness, system maintenance or service, which do not need to be reflected in individual preferences or social norms (Andrews & Waits, 1980).

These different definitions give a glimpse of some of the confusion and controversy that is surrounding the concept of values even in the social sciences, where much thought has been given to the subject. What seems clear is that values are not a list of objects but always state a relationship (Andrews & Waits, 1980; 1995), and, to social scientists, values (as well as beliefs, attitudes and perceptions) are abstract ideas that reside *within* people and not in places or things; humans assign values (Reser & Bentrupperbäumer, 2001; Reser & Bentrupperbäumer, 2005; Rokeach, 1973).

> The construct of 'values', along with attitudes, beliefs, and opinions, has been a core construct of social psychology and other social sciences for most of the last century. From the beginning, this focus on values has been informed by cultural considerations and cultural differences, the nature of human-environment relationships, and indeed commenced as a multidisciplinary collaboration across anthropology, psychology, and sociology (e.g., Allport, Vernon, & Lindzey, 1960; Kluckhohn & Strodtbeck, 1961; Kahl, 1968; Inkeles & Smith 1974; Hofstede, 1980). (Reser & Bentrupperbäumer, 2005 p.129)

In a similar vein, 'nature' and 'environment' are cultural constructs and have differing meanings (Reser & Bentrupperbäumer, 2005) "which are both product of and precursor to their own models, paradigms and parameters" (Ovadia, 2004 p. 47). Values and culture are also connected insofar as we owe our standards for behaviour and our human values to culture (Albrow, 1999).

Sack (1997) has suggested that human beings are geographic beings (*homo geographicus)* that are constrained and enabled by place. 'Place' draws together nature and culture, with culture being an amalgamation of social relations and meaning. Consequently, social values always relate to a geographic area or place, are influenced by it and influence it in return.

Shared value systems become enshrined and embodied in social and cultural institutions, systems, and human environments, and are viewed as core elements of socialization, acculturation, and education processes. (Reser & Bentrupperbäumer, 2005 p.129)

There are many different ways in which values as standards can be activated or employed, suffice it to mention those that seem most relevant to water management. Values as standards can guide us to take a specific stance on social issues, prefer one set of religious or political ideas over another, or help us decide which actions, beliefs, attitudes or values to influence or change in others. Value systems, therefore, can be used as 'general plans' to assist with conflict resolution and decision-making, although, because they are so comprehensive, only a portion of a value system will be activated at a given time, concurrent with the situation at hand (Rokeach, 1973).

Further than solely being used as a guide, values can also be changed in order to achieve or support certain desired outcomes, or social change, which is of particular interest with regard to environmental issues (Reser & Bentrupperbäumer, 2005), such as water where a change seems clearly needed.

Whatever definition is preferred or is appropriate in a given context, the importance of values, as guides for behaviour and decision-making aids for humans and society in general as well as in water management, makes the identification of the values of water crucial; even more so if the outcomes may be used to influence and change behaviour. Hence, the confusion surrounding their definition that has potentially far-reaching consequences for human interaction with the environment (Reser & Bentrupperbäumer, 2005) necessitates a review of the use of 'values' in NRM and WM.

2.1.2 The Use of Values in Natural Resource Management and Water Management

It is important to recognise that the term 'values' in NRM is often used in a way that is inconsistent and incompatible with the accepted social science use as well as its theoretical and conceptual underpinning (Reser & Bentrupperbäumer, 2001; Reser & Bentrupperbäumer, 2005). Changing these incorrect uses may be essential in addressing some of the shortcomings of NRM and WM.

For example, 'environmental values' in environmental management and non-social science research often imply that these values are literal and intrinsic features of the environment. This incorrect assumption also highlights that the separation of values into different categories may be problematic, since a category may indicate that an

object belonging to that class has a value in itself, for example a characteristic in the environment, rather than being valued by people (Reser & Bentrupperbäumer, 2005). This is then reflected in the public discourse, which disregards the philosophical and empirical complexity of the value domain where important distinctions exist between value, values, valuing, kind(s) of values, values systems, valuation, etc. (Ovadia, 2004; Reser & Bentrupperbäumer, 2005).

> It is curious that conventional natural science rigour seems to be abandoned when dealing with issues of methodology and measurement in the domain of values. It is ostensibly possible for scientists to visit a natural area or region, with species and landscape feature list and clipboard in hand, and undertake an audit of world heritage values. Such endeavour would leave most social scientists speechless.
>
> It is interesting that when one looks to what is actually done or recommended, on the ground, the language often changes, and it is clear that what is undertaken is an inventory of flora, fauna, features, processes and interdependencies (Ovadia, 2004 p. 44).

Using such a nominal meaning of value that refers to classes or categories of characteristics also means that these values are not measurable or scalable and therefore cannot be compared or used for monitoring purposes (Ovadia, 2004).

The confusion surrounding 'values' may not be surprising since they are not traditionally associated with resource management or environmental planning but with sociology, anthropology and psychology and other social sciences (Rokeach, 1973), making it difficult for environmental and resource scientists, managers or planners to access the idea because of their natural science and/or technical background. Most would not be familiar with the terms, concepts and methodologies associated with values or know how to approach them in an NRM context (e.g. Colding, 2000; CSIRO & Bureau of Meteorology, 2004; Lawrence, Higgins & Lockie, 2001; Reser & Bentrupperbäumer, 2005; Shaw, 2003).

In addition, "[natural] scientists tend to be suspicious of emotion, imagination and intuitive experience" which is seen as "…subjective and therefore less valid and less real than objective knowledge that can be tested by the scientific method" (Schroeder, 1996 p.16). Therefore, it is potentially difficult to include such experiences, which are often associated with values, into resource management processes and plans that are scientifically based[6]. This may be problematic since the area of values and their

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[6] In the sense of reductionist natural science

inclusion into natural resource management is attracting more attention, as exemplified by World Heritage Areas that are based on environmental and cultural values (Reser & Bentrupperbäumer, 2005).

The general approach to values in NRM appears to be their operationalisation and quantification through inventories and monetary valuation, whereas a "less tortured and confusing path would be to objectively, transparently and systematically measure, document and monitor community and societal values" (Ovadia, 2004 p. 45). The former point is illustrated by the seventeen ecosystem services and functions catalogued and costed by Costanza et al. in 1997 of which only two were concerned with the psychosocial domain (Ovadia, 2004). These were 'recreation' and 'cultural' with only the latter containing actual values (in contrast to all other categories, i.e. aesthetic, artistic, educational, spiritual and scientific values). Then again, Costanza et al. made it clear that all the categories have value with regard to the creation of human welfare, but at the same time there was the problem of using the terms 'valuation' and 'costing' synonymously (Ovadia, 2004).

> Values are, of course, routinely confounded with valuation and evaluation, with evaluation constituting a fundamental psychological process implicated in virtually all appraisals and judgments respecting situations, the world, others, and self (e.g., Tesser & Martin, 1996). These confusions, in environmental management and assessment realms, have substantially augmented and impacted other cross-disciplinary issues and problems with socio-economics and contingent valuation (e.g., Anderson, 1993; Knetsch, 1994; Bazerman, Messick, Tenbrusel, & Wade-Benzoni, 1997; Vatn, 2004). (Reser & Bentrupperbäumer, 2005 p.127)

Obviously, there are many definitional and other issues pertaining to values that need resolving in NRM but, since 'values' indicate what is important to humans, they are essential considerations in water management. The difficulties associated with the use of values in NRM may be illustrated with the help of further specific examples.

2.1.2.1 Environmental, Ecological and Heritage Values

The terms 'environmental' and 'ecological' values are used widely in NRM. This occurs in a variety of ways that are not always consistent with each other, illustrating the concerns outlined above. For example, in Australia, in the National Water Quality Management Strategy (NWQMS) framework, the term Environmental Values (EV) includes ecological, economic and social values but only those related to and needing protection from water pollution (ARMCANZ & ANZECC, 1994). The

Western Australian Environmental Protection Authority (EPA) has consequently adopted the NWQMS definition of EV in its position paper *Perth's Coastal Waters* (EPA, 2000). Of the four EV identified for Perth's coastal waters, the first, Ecosystem Health, is classed as an ecological value and the others, Fishing and Aquaculture, Recreation and Aesthetics, and Industrial Water Supply, are deemed social values (EPA, 2000).

Since, in the social sciences, only the aesthetics component is regarded as a 'real' value (e.g. Ovadia, 2004; Reser & Bentrupperbäumer, 2005; Rokeach, 1973) none of the other values categorised in the examples above as 'social values' really are social values. In contrast, Ecosystem Health, the only 'ecological value' identified in the position paper, could probably be classed as a value since it signifies an environmental condition as a means to an end (although the 'ecological' tag may be confusing since this value is not ecological but assigned by humans). Similar observations have been made by Reser and Bentrupperbäumer (2005) with regard to World Heritage Areas and the environmental and cultural values they are based on. In their example, the managing staff especially seemed to see values as being a characteristic of the environment rather than an attribute assigned by humans (Reser & Bentrupperbäumer, 2005). These examples illustrate the difficulties and confusion about values in WRM and hint at the resulting potential problems with regard to their identification and subsequent monitoring.

In another example, Dunn (2000) writes that ecological values of rivers support local communities and economies and need to be maintained to protect the economic values of river systems. Other important community values, such as aesthetic and recreational values and the value of rivers as a food source, depend also on landscape and ecosystem protection (Dunn, 2000). Although that author recognises the interconnectedness of natural and human systems, similar confusion with regard to values is apparent – ecological values seem to reside in the environment and not within people.

According to the Australian Heritage Commission, natural and cultural values associated with heritage places are called 'heritage values'. The natural values relate to the importance of ecosystems, biological diversity and geodiversity, whereas the cultural component includes spiritual, aesthetic, historic, social, scientific and other special values (Australian Heritage Commission, 1998). Interestingly, this definition

acknowledges 'social' values as 'cultural' values, which differs from the more widespread approach of doing the reverse or considering them separately. Nevertheless, although cultural values in this case include many 'true' values, issues exist with regard to the nature of social values, while with respect to natural values it is unclear who assigns importance to ecosystems and diversity (Reser & Bentrupperbäumer, 2005). Here again, definitional issues seem in need of resolution.

Overall, it appears that the notion that only humans assign values and that values do not reside within the environment are poorly understood in NRM (Reser & Bentrupperbäumer, 2005). This is exemplified by perceptions such as this: that little work has been done concerning the extent of the overlap of social and environmental values and how this affects and could be used in water resource planning and management (Lawrence et al., 2001). It indicates that, besides humans and human relations being perceived to be separate from nature, values are understood to reside either in humans or the natural environment or both.

Although classification of values is possible by sorting values according to content (e.g. Spranger cited in Rokeach 1973 divides values into theoretical, economic, aesthetic, social, political and religious), these content classifications are bound to culture and are not transferable (Rokeach, 1973). Furthermore, since all values are human constructs, the distinction between different categories of values is descriptive rather than denoting a real difference in the type of value.

While 'environmental values' "as a notion, moral compass, and important theoretical perspective and encompassing construct is not only valuable, and necessary, but has strong currency and appeal for communities, planners, managers, legislators, and government bodies" naming them such may be adding to the confusion surrounding the issue in NRM rather than alleviating it. That they "provide a common ground and useful avenue for genuine and much-needed cross-disciplinary collaboration on critical conservation and management fronts" (Reser & Bentrupperbäumer, 2005, p.141) may be important, but makes it even more pressing that definitional issues are resolved.

'Environmental values' are what humans value in the environment (Reser & Bentrupperbäumer, 2005), and although they may represent a real attempt to *objectively* identify elements in the environment that are necessary for ecosystem function or similar, their identification is still based on values and can never *be objective* (M. Fenton, personal communication, 2003).

A way needs to be found to resolve this confusion in NRM although this may have some problematic implications for existing legislation and practices as well as public credibility (Reser & Bentrupperbäumer, 2005). While categories of values may be helpful for communication, if the categories are clearly and consistently defined and the human role in assigning value is acknowledged, it could also be argued that such distinction is not required. It may be less than helpful or even misleading if the notion that only people assign values is not understood. In addition, as Gibbs (2006) pointed out, the separation of values into categories limits their understanding, simplifies issues and glosses over local differences.

The confusion surrounding the concept of values has resulted in many inconsistencies and can distract from the fact that, whatever adjectives 'values' are given, they are all values and, hence, human constructs based on judgements. NRM researchers and practitioners need to be aware of this, so that research, policies, strategies, documents, practices and processes can unambiguously acknowledge and deal with the crucial role of people and our values in interactions with the environment.

2.1.2.2 Intrinsic Value

The case of intrinsic value is worth mentioning separately because it is particularly open to the misunderstanding that values reside in external objects. This type of value is also different insofar as it is generally referred to as value in the singular, unlike other values, but principally because it is not a 'functional' value associated with a utility, function or economic benefit but signifies something that is valuable in itself (Ovadia, 2004; Reser & Bentrupperbäumer, 2005; UNEP Millennium Ecosystem Assessment, 2005).

As opposed to intrinsic value, many of the values in NRM are associated with economics and monetary considerations, which is particularly the case in Western-style market economies.

2.1.2.3 Economic Values

> […] within the social sciences, the use and meaning of values and valuing by economists is idiosyncratic to that discipline and does not accord with general social science usage (Bazerman et al., 1997; Sagoff, 1998). Nevertheless this 'socio-economic' usage is often incorrectly understood by non-social scientists as essentially synonymous with mainstream social science use and convention (Reser & Bentrupperbäumer, 2001b). (Reser & Bentrupperbäumer, 2005 p.127)

That confusion particularly justifies exploring this type of value and associated valuation since it is widely used in NRM and may help perpetuate the problems surrounding values as outlined above.

Modern Western society is dominated by capitalist economy (Giddings, Hopwood & O'Brien, 2002), which explains why "money is the most influential and widely used measure of values" (Albrow, 1999 p. 14). Different types of the same category of goods, different goods, as well as goods and services can be compared with each other through their market value and then traded in a market (Albrow, 1999). Although, sometimes, legal arrangements can be used to correct the lack of an appropriate market, cost-benefit techniques normally need the estimate of 'shadow prices' that measure the accurate value of these goods (Attfield & Dell, 1996).

The cost-benefit approach used by economists assumes that people are able to put a monetary value on a change in their circumstances, which may be acceptable for many decisions. In societies where people work for money, monetary value has been used for non-tradeable goods, for example leisure, where the loss of income through not working can be calculated. Even religious values can be assigned monetary values by asking how much people would sacrifice to observe them (Albrow, 1999).

However, all markets have limitations. Markets exclude certain 'goods' from being traded because they do not have a price, particularly many important environmental properties. Especially in areas that people regard as most important, such as the environment, the associated strong feelings make it extremely difficult, if not impossible, to ascribe such values and make trade-offs (Attfield & Dell, 1996). Trade-offs between other dearly-held values such as health, liberty, truth and courage are also often resisted because they appear unique and incomparable (Albrow, 1999).

In the case of water, markets are seen to have the potential to lead to a more efficient use of water (e.g. for irrigation) by encouraging the production of higher value goods (McKay & Bjornland, 2002; Tisdell & Ward, 2003). However, this depends on the acceptance of water trading, with some reluctance towards markets noted overseas and in Australia. The underlying reasons for the lack of enthusiasm are many and varied but include a disinclination to treat water as a chattel and "a view that markets do not adequately reflect the value of water" (Tisdell & Ward, 2003 p. 63). Maser (1997 p. 5) noted in a wider context that "while 'best potential use' is meant to be in the most

sustainable/environmental sense, it is usually parlayed into disguised economic growth through political power from which few benefit financially" (p. 5).

While water markets have the potential to be part of the solution in some water allocation dilemmas, including those involving water transfers (Knapp, Weinberg, Howitt & Posnikoff, 2003), and can be beneficial in their effects, they also have restrictions (Bjornlund, 2003; Easter, Rosegrant & Dinar, 1999). For example, the potential of water markets to move water to higher value uses can lead ecosystem stress through over-abstraction when agricultural and environmental water is transferred to urban uses, due to higher prices (Jury & Vaux, 2005). In addition, care is required in selecting appropriate rules so that social impacts are not created or exacerbated. Particularly in an urban context, water privatisation can lead to price increases which in turn can result in water not being available to those who cannot pay. The state generally has to put in place a regulatory framework to ensure competition between players in such a 'natural monopoly' situation (Swyngedouw, 2005).

A distinction has to be maintained between water pricing and its value. A 'charge' for water generally applies to water that is part of 'water services', such as water provided to users by utilities or irrigation schemes and removed through sewerage systems. This economic instrument can be useful to affect behaviour and can lead to more efficient water use as well as conservation, while determining the value of water for alternative purposes is useful in rational water allocation (applying the 'opportunity cost' concept) (GWP TAC, 2000).

While there is a general push to value water economically, this does not mean that economic valuation is practical, possible, sufficient or even desirable (Barlow, 2001). After reviewing the applications and inadequacies of economic valuation of ecosystems in water resource management, Emerton and Bos (2004) concluded that although ecosystem valuation contributes often previously ignored information about costs and benefits of ecosystems, it is only one factor in decision-making, and often not the most important one. A critical consideration is that valuation only provides a set of tools that supports decision-making and, hence, has a range of limitations.

By necessity, valuation is only partial since it cannot deal with non-market factors and generally also fails to represent the full value of ecosystems because it can only offer estimates or a range of possible values (Emerton & Bos, 2004). For example, the full value of water can be divided into two major components – its use (or

economic) value and its intrinsic value. The 'use values' include direct values (for 'users'), net benefits of water that is 'lost' through evapo-transpiration or other flows and the benefits provided to society through other direct and indirect ways. It may be difficult to quantify the intrinsic component which refers to 'non-use values' such as bequest or existence values (GWP TAC, 2000) (see section 2.1.2.2). Valuation can also fail to capture the large scale and complexity of ecosystems or the irreplaceability and broad effects of ecosystem services. Obviously, values can also not be quantified in cases where scientific, technical or economic data are unavailable or where ecosystem benefits are associated with human life, cultural or religious significance, which "raises serious ethical questions" (Emerton & Bos, 2004 p. 50).

Generally, it can be said:

Markets do not account for the social costs and benefits to the community and the environment, or consider distributive consequences of trade. Markets will redistribute resources based solely on private benefits and costs. The case would have to be made that trade in water has consequences beyond that of private benefits and costs associated with trade in other goods. (Tisdell & Ward, 2003 p. 70)

Similarly, McKay and Bjornland (2002 p. 401) sum up by saying that:

In the rural sector, the market by itself does not make uni-directional choices that promote social justice or sustainability. At all times, education and community involvement and partnerships are needed, and also a well-funded 'water police' system to ensure that the application of the law is fair. (p. 401)

Other concerns are that ecosystem valuation may focus attention on financial benefits to the detriment of other types of values that cannot be determined that way (Emerton & Bos, 2004). Studies are also often biased and greatly affected by intentions and objectives, which can either lead to under- or over-estimations of value (Emerton & Bos, 2004). In addition, economic valuation does not guarantee wise use, management and protection of ecosystems and, in some cases, particularly when poorly managed, markets or 'payments for services' can even be detrimental to ecosystems and the provision of associated services (Barlow, 2001; Emerton & Bos, 2004). Particularly, long-term ecological costs that are difficult to quantify may be ignored and priorities given to development projects that provide (short-term) monetary economic gains, resulting in serious deleterious long-term effects (Taniyama, 2004).

Since ecosystem valuation is based on perception and is influenced by place and time, results are neither definite or exact, nor transferable or able to be extrapolated (Emerton & Bos, 2004). However, these regional differences in water supply, which depend on environmental conditions as well as historical and cultural backgrounds, are mostly ignored (Taniyama, 2004).

Suggestions to overcome some of the shortcomings of valuation have included, for example, a total economic valuation (TEV) framework, that considers use and non-use values to value water in an irrigated area in Sri Lanka (Renwick, 2001). A different approach suggests complementing monetary with attitudinal assessments of value since they relate to different aspects of benefits and costs, arguing that an estimate of both would provide a more complete picture of values (Taylor & Douglas, 1999).

These and other suggestions may be more appropriate than limited economic approaches, but they must be founded on a good information base.

> An exercise to value ecosystem water benefits has little meaning, and is likely to have only limited accuracy, unless it is based on a sound appreciation and good information about ecological, hydrological, institutional and social aspects of ecosystem management and water goods and services. In particular, valuation studies require data which relate ecosystem status to benefit provision, as well as detailed information about the allocation of rights, responsibilities and access to ecosystem management, water goods and services. (Emerton & Bos, 2004 p. 50)

Given the complexity of ecosystems, social systems and their interactions as well as the lack of appropriate information in many situations, especially with regard to psychosocial aspects and values outlined earlier in this chapter, accurate valuation of water benefits may be difficult to achieve. This highlights that economic valuation, especially if used alone, may be inappropriate for water. Many people regard water as the common property of humankind and future generations which should be exempted from the general trend of commodification (Barlow, 2001). Similarly, it has been argued that in Japan and other monsoonal climate countries, due to the extreme differences in precipitation, water should to be treated as a "common property of the whole community, a boon of nature to be shared by all" (2004). This includes shared suffering in times of drought, but also communal maintenance of the resource.

Such a 'common property' stance requires a broader approach to WM than that suggested by the current (Western) economic rationalist approach with its narrow application of economic value. This is part of the reason why ideas such as

sustainability (see Chapter 3) and integration (see Chapter 4) have developed. However, as identified earlier, psychosocial aspects and values (in the 'true' sense) have been neglected in NRM, hence addressing this shortcoming requires, among other things, the identification and measurement of values.

2.1.2.4 Determination and measurement of values

> Our view is this: there are complications in and limitations to our capacities to compare values, but they are not so severe as to make impossible the aim of comparing systematically the values that come into environmental disputes and reaching a decision about what the most valuable (or least damaging) course is. (Attfield & Dell, 1996 p. 43)

Values cannot be observed directly but can be measured through attitude (Taylor & Douglas, 1999) using psychometric procedures and scales, which are reasonably rigorous and systematic (Reser & Bentrupperbäumer, 2001) or through instruments such as a 'values survey' which is an ordinal and ipsative way to reliably and validly measure values in individuals and their society (Rokeach, 1973).

Both rating and ranking systems can be used to determine values and their importance. The two systems can lead to different results when comparing groups of people. While ranking forces participants to order values in a list according to importance, rating allows independent indication of importance of values on a Likert scale or similar (Ovadia, 2004). Each method has benefits and disadvantages but both are valid and useful. Although, usually, only one of these approaches is used, Ovadia (2004) argues that the incorporation of both ratings and rankings can give added insight since they return different information and allow for different conclusions. Their combination not only produces better data but also embraces a more refined model of the value system (Ovadia, 2004).

Comparison of values raises some issues with regard to precision; in cases where values are quite evenly balanced all that can be said is that these values are roughly equal. Another limitation becomes apparent in cases where values cannot be added or subtracted, for example when a particular amount of a value prevails over any amount of another value. However, these limitations do not preclude the comparison of competing values in environmental decisions since the judgement that *"this is more valuable than that"* is still possible (Attfield & Dell, 1996 p.45 original emphasis).

Although values measurements have been undertaken for at least 30 years (Ovadia, 2004), there appears to be a lack of knowledge about how this can be applied to the values of water (with the exception of economic values). This is especially the case for the more intangible ones, and is only gradually being overcome (M. White, personal communication, 2001) (see also Burmil, Daniel & Hetherington, 1998; Burril, 1997).

While values can be measured in individuals they are also expressed in texts, images, discourses and other cultural products. This may add to another difficulty, namely that of deciding which social elements or values should be included in water management or allocation projects, i.e. only those directly affected by or affecting a water allocation or planning scenario or also those that are indirectly involved.

It has been suggested that "the measurement of values *is* relevant to virtually any human problem one might be able to think of" (Rokeach, 1973 p.52). This makes the neglect of the values of water and their measurement as well as the confusion about the concept in NRM a serious concern, and highlights the importance of understanding the values of water.

2.1.3 The Importance of Values in Water Management

The confusion surrounding values and the use of the concept in NRM and WM cannot detract from values indicating importance of items or functions to people. The strong connection between what people value and what people need (Rokeach, 1973) can be an expression of function, while preferences are also important but may not relate directly to needs.

The identification of functional values not directly or obviously related to people is crucial since functional values indicate important aspects, environmental or otherwise, which need to be considered in management and decision-making. Functional values may be regarded as less subjective than preference values as certain functions, such as those related to ecosystem services, are necessary for survival or essential for life-forms other than humans. Nevertheless, perceptions of the state and status of these functions are clearly subjective and regarding life in all its present forms as valuable, intrinsically or specifically, to humans, is a form of value judgement as well.

There comes a point where a stance or base is required in order to enable practical operation and meaningful decision-making. Here, the view is adopted that life in all its diversity, including humanity, is valuable and all functions that support life and its diversity need to be maintained (see also Milbrath, 1989 as outlined in Chapter 3). This is the first premise and all other values need to fit in with this principle. Hence, all preferences need to take this into account and may have to be modified to fit.

Clearly, this principle should not be violated by human action and it is vital to balance and curb the unavoidable impacts humans have on the environment, in order to survive. Currently, despite efforts and progress in sustainability, this is not the case, for a variety of reasons, one of which is the limited understanding of human interconnections with and dependence on the environment, particularly with regard to water.

It is hoped that the attempt to identify and clarify the values of water in the second part of this chapter will provide much-needed support for water management so that well-informed decisions can be made and a better life for humans *in* and *with* the environment can be achieved through being grounded in a clarified values base.

2.2 The Values of Water

Generally, the values of water are associated with basic human needs, health and wellbeing, including water for drinking, cooking and hygiene as well as support of livelihood, wellbeing and community cohesion, but also spiritual, intellectual and aesthetic needs. They comprise indigenous and other cultural aspects, educational and psychological needs, as well as gender equity issues. Other areas such as tourism and recreation have a more pronounced economic component, as have many of the indirect water uses, such as those associated with electricity generation, transport, industry, irrigated agriculture and life-style issues, including gardening and swimming pools. Indirect social issues are associated with follow-on effects from water allocation decisions and initiatives as well as water markets (Syme, Porter et al., 2004). In the literature, subsets of these needs are sometimes labelled 'socio-economic'.

When comparing the psychosocial aspects that various authors have identified for consideration in different NRM contexts, all of the lists appear incomplete but also overlap to a degree.

The Independent Advisory Committee on Socio-economic Analysis (1998) outlined four areas of concern for socio-economic impact assessment, namely:

- way of life - how people live, work and interact with each other;
- cultural traditions - shared beliefs, customs and values;
- community cohesion, stability and character, as well as services and facilities; and/or
- standard and quality of life - level of income, ranges of choices in consumption as well as quality and quantity of community infrastructure.

Attfield and Dell (1996) give a comprehensive list of human interests in the natural environment, realising that these elements can be and are bound to be conflicting in decisions about the environment:

- life and health – clean air and water, preservation of the biosphere and ecosystems;
- mental health – freedom from stress, insecurity, drudgery, tedium; cultivation of memory and sense of identity; opportunities for recreation and renewal in the natural environment, autonomy, planning and decision-making;
- aesthetics – enjoyment of natural beauty, human art, experience of natural elements (sun, wind, ocean) and diversity;
- intellectual – study and contemplation of nature, human achievements and monuments;
- spiritual – cultivation of tranquillity, experience of solitude and wilderness, places significant to the human past; interesting and meaningful work;
- economic – needs for goods and services. Organisation of human communities to produce goods and services to satisfy needs normally requires a property system;
- social needs – sense of community and fraternity.

Manning et al. (1999) propose 11 potential values of forests, based on the work of others. Although this list differs in detail it appears to be covering many of the needs identified by Attfield and Dell and could be relevant for water management. These values[7] are:

- aesthetic;
- ecological;
- recreation;
- education;

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[7] Note the use of the term 'values' here, which is in need of clarification.

- moral/ethical;
- historical/cultural;
- therapeutic;
- scientific;

- intellectual;
- spiritual and
- economic

Similarly, the Millennium Ecosystem Assessment examination of the influences of ecosystem services on human wellbeing, seen as comprised of several components, includes:

- *basic material for a good life*, such as secure and adequate livelihoods, enough food at all times, shelter, clothing, and access to goods;
- *health*, including feeling well and having a healthy physical environment, such as clean air and access to clean water;
- *good social relations*, including social cohesion, mutual respect, and the ability to help others and provide for children;
- *security*, including secure access to natural and other resources, personal safety, and security from natural and human-made disasters; and
- *freedom of choice and action*, including the opportunity to achieve what an individual values doing and being. (Millennium Ecosystem Assessment, 2005 p.v)

Psychosocial aspects in water management or water values can be regarded as the 'interface' between people and a substance that is integral to life. One way of conceptualising this interface is with the help of the Sphere of Needs (SoN) (Figure 1). This sphere was developed by Syme (2002) as an organisational primer for the consideration of a range of individual and community needs with regard to water, all of which should be met to achieve socially sustainable outcomes. Some of the needs are interrelated and providing for one need may also take care of another, at least partially (Syme, Porter et al., 2004).
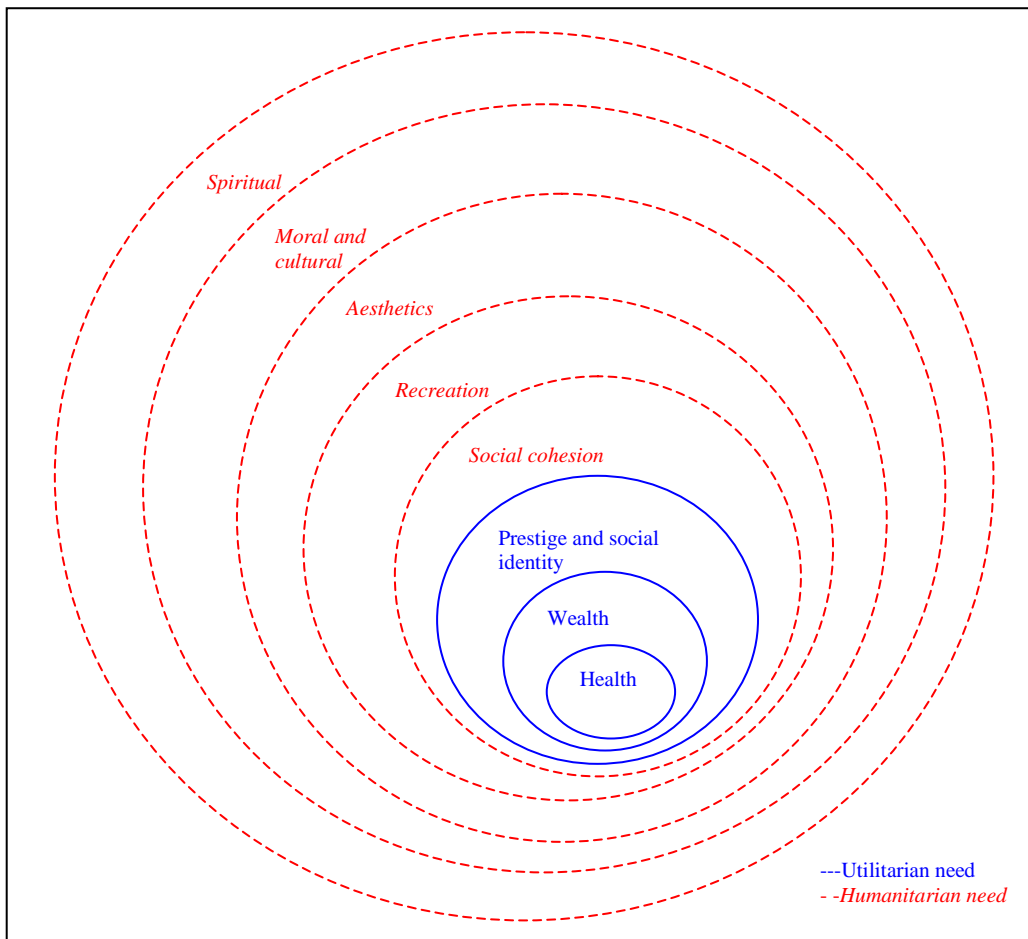
Figure 2.1: Sphere of Needs (SoN) met by Water (after Syme, 2002)

The order of layers within the model indicates their growing complexity and the uncertainty of the associated needs (radiating from the central concept of 'health'). The interconnectivity of all layers is not shown but implied by the nested design – they all depend on each other (see below). Consequently, it is not necessary to move through this model in a sequential manner.

A suggestion has been made to acknowledge the place-specific and complex nature of the values of water and take account of their variation and diversity in a framework called 'valuing variability' which would allow the consideration of diverse values as well as changes stemming from new knowledge and attitudes, e.g. towards floods and drought (Gibbs, 2006).

> …rather than forcing complex and interconnected values into prescribed categories, understandings of specific local values would be fostered. Valuing variability provides a means for articulating and developing an understanding of values associated with water in a particular place, rather than simplifying local realities and reducing understandings of value to fit into generic categories

developed elsewhere. In this way, valuing variability is concerned not with a generalised idea of water but with specific water in particular places. (Gibbs, 2006 p.83)

Nevertheless, a 'list' of values can be useful to highlight the breadth and variety of the values of water and show the importance and interconnectedness of water. That such a list will always remain incomplete only highlights the subjectivity and complexity of water.

The SoN is a useful starting point for a more detailed look at the psychosocial aspects of WM, i.e. the values of water, but comparison of its categories with those in the previous lists has uncovered some discrepancies and missing elements so the SoN has been broadened. The different categories are outlined in the following sections.

2.2.1 Human Water Uses and Needs ≈ the Values of Water

Similar to the SoN, the following list of water values, which can be roughly equated to human water uses and needs, is not to be viewed in a hierarchical way since most of these aspects are interrelated and connected to others. However, since this is a linear document, the categories will be described starting with the simplest and most basic, that of survival and basic needs, and ending with the most complex and intangible, spiritual meaning. Major interconnections are indicated through cross-references. The categories include both direct and indirect needs, the latter not always being immediately obvious. There is no claim to complete coverage of issues.

2.2.1.1 Water for Survival and Security, Health, Wellbeing and Therapeutic Uses

The central and most important human needs for water are those of survival and health. Survival includes water for drinking, cooking and eating, washing, cleaning, hygiene and healthcare. Water for waste removal is also included here. Gleick's (1996) basic human water requirements pertain to four areas: drinking, sanitation, bathing and food preparation. He stipulates at least 50 litres per person per day (l/p/d) for health and a minimum quality of life, although in reality many people around the world must make do with much less than that.

Gleick (1996) outlines the attempts to identify water needs for food production. The difficulties of doing so are due to the vast differences in food preferences, climatic conditions, soil properties and other factors between countries and regions, as well as

the transport of food from water-rich areas to water-poor ones[8]. He maintains that water for food production is a special case and needs to be considered separately from basic human water needs.

Given that water is essential for survival and health, and the 'right to life' and 'health and wellbeing' are Human Rights according to Articles 3 and 25 of the *Universal Declaration of Human Rights* (United Nations, 1948) and Article 12 of the *International Covenant on Economic, Social and Cultural Rights* (Committee on Economic Social and Cultural Rights, 2000) the implication is that adequate water for survival and health is a Human Right as well (Scanlon, Cassar & Nemes, 2004). The legal basis of the right to water is outlined in more detail in the Committee on Economic, Social and Cultural Rights' (2003) General Comment 15: *The Right to Water*, and include the *Convention on the Elimination of All Forms of Discrimination Against Women* (Art.14, para. 2) and the *Convention on the Rights of the Child* (Art. 24, para. 2) (see also 2.1.2.2).

Water is necessary in order to realise many other rights outlined in the *Covenant on Economic, Social and Cultural Rights* in addition to those pertaining to personal and domestic water use, which always have priority. They include water for food production (right to adequate food), environmental hygiene (right to health), securing livelihoods (right to gain a living through work) and cultural practices (right to take part in cultural life). Implied is the right to equitable access to water for agriculture, subsistence farming and the livelihoods of indigenous peoples (Committee on Economic Social and Cultural Rights, 2003).

Obviously, the quality of water used for drinking is crucial (International Water Association, 2004). Therefore it is paramount that the water sources used for that purpose (rainwater, groundwater, rivers and lakes) remain free from pollution and health hazards (Committee on Economic Social and Cultural Rights, 2003; World Health Organization, 2004b). Clean air and soil that is not contaminated are important aspects here. Water in rivers, streams and dams used for the production of fish and other aquatic food items or for recreational purposes, as well as water used for irrigation of food crops and pastures needs to be of sufficient quality to ensure no detrimental health effects, both in the short- and long-term (ANZECC & ARMCANZ, 2000; Committee on Economic Social and Cultural Rights, 2003; World Health Organization, 2004a).

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[8] According to (2005) 3500 l of water are needed per person per day to produce 3000 kcal of food, which

Health has psychological and mental aspects, and it has been shown that water and water bodies may positively influence these (see 2.2.1.5 and 2.2.1.6). Spiritual aspects of health should also be considered (see 2.3.1.11). In fact, most uses of water contribute to the health and wellbeing of an individual, since the previously narrow bio-medical model of health espoused by Western medicine has been expanded in recent years. It now refers to total wellbeing or quality of life based on social, economic, environmental and spiritual wellbeing as well as the associated subjective perceptions and experiences (World Health Organisation, 1986). Nevertheless, treatments using water, such as hydrotherapy, are valuable in many applications, e.g. for rehabilitation of people with dementia, who apparently get much enjoyment from treatment with water (Smith, 2003). Records show that people, who could afford to do so, have visited spas to benefit from 'taking the waters' since Babylonian times (Blackbourn, 2002).

The 'Biophilia hypothesis' suggests that humans have an innate connection with nature that goes beyond utilitarian or aesthetic appreciation (Wilson, 1993).

> This proposition suggests that human identity and personal fulfilment somehow depend on our relationship to nature. The human need for nature is linked not just to the material exploitation of the environment but also to the influences of the natural world on our emotional, cognitive, aesthetic and even spiritual development. (Kellert, 2005 p.131)

Contact with nature has many health benefits (Frumkin, 2001; Maller, Townsend, Pryor, Brown & St Leger, 2006), and landscapes with water have been found to have a calming influence and can reduce stress (Strang, 2005; Ulrich, 1995). Direct applications of water have many benefits that are regularly used in rehabilitation and aged as well as mental health care (e.g. Constant, Guillemin, Collin & Boulange, 1998; Eversden, Maggs, Nightingale & Jobanputra, 2007; Silva, Valim, Pessanha et al., 2007; Smith, 2003).

Human behaviour and endeavour can influence water quantity and quality directly and indirectly in many areas, whereas the available quantity and quality of water and the amenity it supports influences human wellbeing (Strang, 2005). It is therefore important to recognise and understand these interconnections in order to ensure long-term health for people as well as the environment. An important element in this interconnection is wealth and associated issues.

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is 70 times the recommended minimum of 50 l for personal use.

2.2.1.2 Wealth, Standard of Life, Economic Wellbeing and Livelihood

Pepperdine (2001) sees wealth as related to prosperity and therefore economic viability and financial security. In England, from Roman times, water was used to drive water wheels and mills, thereby contributing to its economic wealth. Riverine resources such as reeds for thatch and fish for food also were a factor (Strang, 2004). This continues to be the case to this day in many countries, especially in lesser developed regions where these resources often form people's livelihood (Bennett, 1998; Pollard, 2002; Winpenny, 1994).

Today, water is used throughout the world to generate revenue through irrigation and food production (agriculture, fisheries and aquaculture), tourism and recreation, as well as industrial products and power generation, flood protection and supply of drinking water (Wallace et al., 2003). Often, these relatively short-term gains are derived from severe changes to natural water flow through reservoirs and dams, irrigation schemes and embankments, which are not sustainable in the long term (Wallace et al., 2003) while industry and agriculture can cause pollution that might render water useless for other purposes (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Waste (sewage) disposal, real estate and provision of transport ways, as well as science, research and education can also create income that is directly or indirectly related to water. Rivers and their catchments provide a basis for economic activities such as water extraction, mining, forestry and agriculture (Lange, Mungatana & Hassan, 2007; Meybeck, 2003), but other sources such as groundwater also play an increasingly important role. The intimate connection of water with economic development in general is also increasingly recognised (Falkenmark & the Symposium Scientific Programme Committee, 2005) as is the fact that water is important for virtually all industry (Ball, 2001; WBCSD, 2006), which requires water of sufficient quality and quantity to fulfil the listed functions on an ongoing basis. Water, and its uses, can provide many employment opportunities, thereby contributing to wealth, which in turn has positive effects on community viability, cohesion and morale (Pepperdine & Ewing, 2001) (see 2.3.1.4).

A significant connection between wealth and water lies in the fact that often the most fertile land, with its high importance for the creation and maintenance of wealth, is situated along watercourses and on flood plains (Postel & Richter, 2003; Strang, 2004).

As a result, this land is sought after and often owned by wealthy people who alone can afford to buy it, sometimes restricting access to water for other members of the community (Strang, 2004). Since water is closely related to the creation of wealth there is a danger of perpetuating inequality and power struggles if only a few people or institutions have or control access to water (Strang, 2004). Inequality also leads to poorer health outcomes (e.g. Lynch, Smith, Kaplan & House, 2000; Power & Matthews, 1997). Hence, some water management and allocation policies now emphasise equity and equitable distribution of water, e.g. in South Africa (Backeberg, 2005; Hamann & O'Riordan, 1999; The Water Page, 2000/1a).

Land that has views of water increases the price of real estate (e.g. Askew & McGuirk, 2004; Bourassa, Hoesli & Sun, 2003). This is especially the case if such views in a given location are rare; therefore prices vary with the location but also with demand due to the limited supply (unlike characteristics such as floor size which are much more elastic) (Bourassa et al., 2003).

Currently, particularly in Western society, water is often seen as an economic good with associated markets and privatisation efforts. While this approach can contribute to greater appreciation of the values of water (Smith, de Groot & Bergkamp, 2006; Winpenny, 1994) it can also be limiting by sidelining issues that do not lend themselves to monetary valuation (Emerton & Bos, 2004) (see 2.1.2.3). It also supports the already existing inequity between developing and developed countries since many of the former have a limited supply of water for at least part of the year which affects their socio-economic progress (Falkenmark & the Symposium Scientific Programme Committee, 2005). Their situation can be exacerbated by insufficient water as well as by too much water, such as floods.

Problems associated with water markets within developed countries are less obvious. In Australia, the separation of land from water through the COAG water reform[9] has allowed the creation of temporary and permanent water markets, which are possibly affecting long-term equity and community sustainability (McKay & Bjornland, 2002). Negative social effects are expected if so-called 'sleeper' water is sold, especially in fully allocated areas, resulting in all water users having their allocations reduced to keep overall water abstraction within allowable levels. This may force active

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[9] The Council of Australian Governments (COAG) initiated a water management reform process in Australia in 1994 which has resulted, among other projects, in an Agreement on a National Water Initiative (NWI), which is analysed in detail in Chapter 7.

irrigators to buy more water from people who have never used it before, potentially leading to unfair income distribution. Another effect of water markets is the separation of communities into the water-rich and the water-poor, where the water-poor often sell their entitlements to fund ongoing farm activities, potentially leading to the decline of their own operations in the long run (McKay & Bjornland, 2002).

Conversely, trading can move water from small 'life-style' farmers to larger commercial and more efficient farms, for which water costs are a small expense, which can help create environmental and economic benefits. This can improve or maintain the viability of rural communities and therefore increase their sustainability. At the same time, the proportion of life-style farmers who often can afford to invest in water and have a more positive environmental attitude toward agriculture is increasing with potentially positive effects regarding sustainable outcomes, but it can also lead to conflict (McKay & Bjornland, 2002).

2.2.1.3 Prestige, Social Identity and Stability

Prestige and status, as well as social standing and social identity depend to an extent on adequate wealth, which, in turn, can substantially depend on water (see 2.3.1.2). Social stability also belongs in this category and includes family cohesion, low illegal drug use as well as low crime and suicide rates (Pepperdine & Ewing, 2001), highlighting the connection of social identity with better health outcomes (see 2.3.1.1).

Attachment to place or a local area also contributes to identity and can provide a sense of continuity and future (Pepperdine & Ewing, 2001). Communities are defined, at least in part, by their setting (Strang, 2005), while the values, worldview and characteristics held by a community influence the surrounding environment (Maser, 1997).

Ownership of water can impart considerable power and status to the owner since he or she is then able to grant or deny access to an essential and life-giving resource (Strang, 2004). Consequently, power and the control of water are closely linked. Ancient empires were built on the control of water and even today water means great political power, as can be seen in the Middle East and many other locations, where conflict is constant because upstream users have control over the amount of water available to downstream users.

2.2.1.4 Social Cohesion, Good Relations and Social Needs

Social cohesion is expressed by the ability of a community to cooperate and work together to function as a supportive and unified whole (Pepperdine & Ewing, 2001). It also includes community-mindedness that places importance on the local community and is expressed by an active community life and neighbourliness. A cohesive community is inclusive (open to outside help) and accepting of different points of view, other ideas and newcomers (Pepperdine & Ewing, 2001). An ethic of care is central to this. A cohesive community that interacts well also provides a positive background for the formation of values and for moral development (Smith, 2000).

Meeting basic requirements such as health, wealth and social identity, many of which depend on water (see 2.3.1.1, 2.3.1.2 and 2.3.1.3), help to build and maintain a cohesive community. Catchment management and other interest groups (e.g. Landcare groups, conservation groups or sports associations) have important functions for community cohesion (Heilpern, Wright & Tkachenko, 2000), which helps build social capital while increasing satisfaction and health in the participants (Moore, Townsend & Oldroyd, 2006).

A common threat such as drought, flood or other disaster has the potential to bring people together and increase social cohesion. The concern and care for a common resource, such as water, on which communities depend directly and indirectly, can also contribute to the strengthening of communities (Strang, 2004). Rivers as well as infrastructure that depends on water (e.g. mills) can contribute to social cohesion by providing focal points, socio-spatial context and bases for collective social identity (e.g. as inhabitants of a certain valley) (Strang, 2005).

The establishment of water markets (see section 2.3.1.2) as well as problems with water allocation or access to water can create tension and conflict, especially between the water-rich and the water-poor, potentially negatively influencing community cohesion, even to the extent of splitting a community. A functional community should be able to resolve such conflicts, but a community that is losing its members due to a loss of jobs and non-viable farms can experience a loss of cohesion (Bjornland & McKay, 1999) while the influx of many newcomers in a short time may stretch or compromise the capacity of a community to absorb and integrate these people (Strang, 2004).

In some irrigation communities there are indications that water markets can facilitate structural adjustment. That is, they can assist communities to become more sustainable by forcing non-viable farmers out of business and creating larger, more water efficient and environmentally sound farms (see 2.3.1.3). However, for marginal farmers to sell their water rights, e.g. to finance everyday farm operations or pay off short-term debt, may result in even less viable operations. The low returns when they eventually have to sell their farms may be insufficient to start a new life somewhere else and they could end in poverty (Bjornland & McKay, 1999). Nevertheless, Bjornland (2002) stresses the role of non-permanent water markets in extending the time for non-viable farmers to sell their properties thereby giving communities more time to adjust to changes associated with the loss of their members.

An example of social fragmentation emerges in the 17th century in Dorset, England, where technology development led to associated redundancies and increased dispossession. It "has meant a crucial shift away from collective ownership and management, placing water resources in the hands of small groups of people who either own the infrastructure and rights to abstract and supply water, or are empowered by specialised knowledge and expertise" (p. 21), possibly leaving the rest of the population disenfranchised from participation (Strang, 2004).

Social cohesion is central for functioning communities and, therefore, all efforts should be made to maintain communities by ensuring that new policy measures do not unintentionally lead to a loss of viability forcing people to leave (Chaskin, 2006; Goodman, Speers, McLeroy et al., 1998). Structural adjustment measures should facilitate the creation of more viable and efficient farms while creating jobs for those who may have to give up their farming operations (Bjornland, 2002). Although less obvious, sporting clubs and communal recreational activities as well as community organisations, such as Landcare groups, can play a major role in community cohesion and wellbeing by providing social networks and support (Maller et al., 2006; SCN, 2003). Water can play an important role in these, either directly, as a means for recreation or sport, or indirectly, e.g. as an element of weather.

2.2.1.5 Recreation

Water is essential for many forms of recreation; directly for swimming, boating and windsurfing, and indirectly for fishing, as a focal point for picnics and walks and other nature appreciation activities, such as bird watching and aesthetic enjoyment

(Heathcote, 1998). Rivers and their wider catchments provide many more water-enhanced recreational and tourist activities (Environment Australia, 1998), which include camping, bushwalking, rock climbing, photography, painting, nature studies, sightseeing, picnicking, fossicking and hunting.

Water is also used for recreation in swimming pools and spas in suburban gardens as well as in public facilities. The popularity of 'water features' for gardens is growing and with them the associated water use (Askew & McGuirk, 2004; Syme, Shao, Po & Campbell, 2004). In addition, extensive lawn areas, which are responsible for most of the water used in gardens, are still popular in Australia despite a shift to more low-maintenance leisure-centred garden styles (Askew & McGuirk, 2004).

Gardening is not only associated with water use but its therapeutic effects are well established, as are the positive effects of plants and gardens, even a view of green scenery, on the recuperation after illness and injury, as well as on the aggression levels of prison inhabitants (Frumkin, 2001; Maller et al., 2006). These effects are not limited to gardens but extend to recreation in the outdoors in general, which enhances health and wellbeing in psychiatric patients, individuals with problems ranging from depression to substance abuse, as well as healthy individuals (Canadian Parks and Recreation Association and Health Canada, 1997; Ewert, 1996; Frumkin, 2001; Hamilton-Smith, 1997; Maller et al., 2006) (see also 2.3.1.1).

Since water bodies and their associated landscapes attract tourists through their aesthetics and recreation possibilities, they provide a source of income and wealth for communities situated nearby (Orr & Colby, 2002) (see 2.3.1.2) which normally outweigh the negative effects of increased prices or reduced quality of life (Andereck, Valentine, Knopf & Vogt, 2005). In this context, the maintenance of the attractive attributes of water bodies as well as their water quality is important (World Health Organization, 2004a).

Tourism can contribute to the preservation of natural areas (and, hence, water quality) because it can provide greater economic benefits than alternative uses (e.g. logging), with added benefits such as the protection of wetlands, improved management of those areas and increased appreciation of the value of natural areas through provision of education (Andereck, 1995). The proliferation of ecotourism certification and awards as well as the establishment of such organisations as the International Ecotourism

Society illustrate the growing popularity of travel that is aimed at "connecting conservation, communities, and sustainable travel" (TIES, 2008).

2.2.1.6 Aesthetics

The aesthetics of water has different aspects which are all based on sensory experience and perceptions which are influenced by cultural context (Gandy, 2006; Strang, 2005).

Those associated with water quality in the sense of visual and olfactory pollution can be measured quantitatively while those related to visual/artistic impressions of water in its surroundings are qualitative. The saying 'beauty is in the eye of the beholder' hints at the subjectivity and social construction of these perceptions but also expresses that although other senses can be involved, aesthetics is mainly placed in the visual domain.

People like to look at water and prefer landscapes with water bodies and/or mountains to those without (Herzog, Herbert, Kaplan & Crooks, 2000; Ulrich, 1995; Wherrett, 2000). Savannah-like landscapes with scattered vegetation and water have appeal across cultures (various authors cited in Frumkin, 2001; Strang, 2005). Since these features add to the popularity of a place, they are important for tourism and associated industries as well as for real estate (see 2.3.1.2 and 2.3.1.5). An indicator of the importance of 'indirect' water availability, e.g. through rain, is that people prefer landscapes that are lush and green or feature healthy looking vegetation over those that are dry or appear unhealthy (Ulrich, 1995).

Interestingly, landscape preferences have changed over time. Only a few centuries ago people despised mountains, particularly in Europe and America, but while this has changed it is apparently still true today for wetlands (Callicott, 2003).[10] This dislike was possibly a factor in the loss of wetlands in various places (Carlsson, Frykblom & Liljenstolpe, 2003, for example, have described the loss of over 90% of wetlands in southern Sweden) with consequences for biodiversity and ecosystem function that are possibly much more substantial than understood at present. In the Perth metropolitan region and in south-western Australia, over 70% of all wetlands have been

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[10] There may be a definitional issue hidden here since 'wetland' is a broad concept that can contain lakes and swamps or any other feature associated with the surface expression of standing (fresh)water (as opposed to flowing). Generally, people like the look of water, while swamp areas that are mainly wet and muddy, possibly vegetated containing breeding grounds for 'nasties' such as snakes and mosquitoes are more often disliked.

lost to development (Davis & Froend, 1999), but despite this, or possibly because of it, wetlands (permanent and ephemeral) seem to be highly valued by the community (Syme & Nancarrow, 2007).

Water features prominently in the arts (Strang, 2005), mainly in drawings and paintings but also in poetry, other literature and in music, reflecting its importance to human aesthetic experiences. Conversely, since Western modern aesthetics is predominantly visually orientated, nature must imitate art to be considered aesthetically pleasing (Callicott, 2003). In Australia, this is exemplified by a preference of manicured parks and landscaped gardens, some of which contain ornamental water features, over those planted with native species (Askew & McGuirk, 2004), which can be perceived as unsightly (Woolcott, Wong & Vershoor, 2002).

> Water's aesthetic qualities are not restricted to art. Cascading waterfalls, rippling brooks, and tranquil mountain streams are prime examples of how water's aesthetic qualities exemplify its intrinsic value. Moreover, water as an artistic medium directly influences our perceptions of water in nature as well as in art. Thus, it seems that water's aesthetic qualities draw attention to its intrinsic value in both natural and cultural contexts. (Simus, 2004 p.1)

Simus (2004 pp.1-2) points out that water as such does not have any aesthetic qualities of its own but that these "are formed entirely by the environment in which it functions. Environmental factors such as gravity, light, containment, momentum, and surface contact form water's aesthetic qualities". In this context, it is important to note that landscape is the perceived (mainly visually) environment and therefore an aesthetic object resulting from the interaction of the perceiver and that object, in this case the environment, comprised of the biophysical attributes of an area without interpretation.

For example, the beauty of a reservoir in Greece was not defined by its water level but by the 'dead zones' that were visible when the water levels were below a certain height (Christofides, Efstratiades, Sargentis, Koutsoyiannis & Hadjibiros, 2005; Sargentis, Hadjibiros & Christofides, 2005) highlighting the close relationship of water with its surroundings. However, here, as elsewhere, the subjectivity of 'beauty' is demonstrated since what was acceptable to some people, i.e. visitors generally did not mind lower water levels, was not acceptable to others, but locals who saw the lake every day did not like the dead zones (Sargentis et al., 2005). These findings also highlight the contention that people's background in terms of location, education and other life

experiences influences what they 'see' in a landscape (Pedroli, Pinto-Correia & Cornish, 2006).

An important part of maintaining the aesthetic appeal of water bodies is related to colour and water clarity (Smith, Croker & McFarlane, 1995) but also its smell (Strang, 2005). Apart from not posing a health risk or a safety hazard, water must be appealing to people. Smith et al. (1995) found a close link between the appearance of water and its use for bathing, where it is important to maintain water clarity at a depth of at least 1.5 to 2m and ensure that the colour of water remains as close to a blue or blue-green as possible. With naturally coloured water (e.g. yellow or brown colour from leaf tannins) people need to understand why this occurs to be happy to use the water for bathing (Smith et al., 1995) (see also 2.3.1.5).

At present the aesthetics of water itself are measured quantitatively through water quality indicators that are related to litter, surface pollutants (oil, scum, foam, etc.), odour and colour (e.g. Environment Agency UK, 2005). Quantification of aesthetic value is also being attempted through willingness-to-pay estimates where people are asked to approximate how much they would be prepared to pay for the beautiful and attractive qualities of a river or other water feature. It is argued that this method allows the assessment of the total aesthetic value of a water feature if the average value is multiplied by the number of community members or participants in the process (Gaylord Nelson Institute for Environmental Studies, 2000). Although problems with quantifying aesthetics are acknowledged, money is seen by some as a useful scale of comparison since many other aspects relevant to decision-making are also based on it (Gaylord Nelson Institute for Environmental Studies, 2000).

This contrasts starkly with Aldo Leopold's unique autonomous natural aesthetic that not only refers to the visual appeal of a landscape but entails being "in the natural environment, as the mobile centre of a three-dimensional, multi-sensuous experiential continuum" (Callicott, 2003 p. 39) that includes sound (for example that of rain), sensation (such as the feeling of water drops on the skin), smells and taste (such as that of water) as well as the visual experiences, and also involves the mind (faculty of cognition). For Leopold, aesthetic appeal has more to do with integrity of evolutionary heritage and ecological processes than visual and scenic qualities (Callicott, 2003). It would be difficult, if not impossible, to express all these qualities and experiences in monetary terms.

Similarly, Simus (2004) claims that the quantification of the aesthetic qualities of water alone is insufficient, even misleading, since it does not completely reflect the human influence on water quality in a watershed or human interest in protecting water quality. "The aesthetic appreciation of water should attend to *how* water functions in a particular watershed, rather than focus upon what water *is*, because water has no qualities of its own. An aesthetic characterisation of water's ability to sustain life, along with quantitative analysis, can establish a new metric for water quality evaluation that can influence water policy formation" (Simus, 2004 pp. 3/4). These reflections imply moral, ethical and cultural connections to 'water in landscape'.

2.2.1.7 Moral, Ethical and Cultural Aspects

Virtually all cultures place importance on water, and for some it is of central concern, defining and even determining many or all aspects of life (Strang, 2005). This is reflected in language, architecture, the arts, rituals and ceremonies, both indigenous and non-indigenous. For example, rivers and floodplains have been the focus for human activities such as settlement, transport, communications and recreation for a long time (Rolston, 2000; Strang, 2004), and hold "significant cultural and social values as a focus for spiritual, political, national or other cultural sentiment" (Environment Australia, 1998 p.3). Rivers and places in floodplains can have historical importance due to notable eras, events, structures or people since European settlement (Environment Australia, 1998; Stewart, 2004; Stokes, McAllister, Ash & Gross, 2008; Taylor, 2007) while many key landscape architectural works (e.g. in Australia) are also associated with water (Freestone, Marsden & Garnaut, 2008).

Water obviously features highly in the culture of people who live close to water and whose lives may be closely associated with water, such as fisher people, seafarers and ship owners, etc. Many older cultures in Europe had sacred wells and springs, which later were also used by the Romans as places of worship (Strang, 2004). The Balinese rice paddy culture with its water temples and related practices is an example of a water culture that has worked sustainably for thousands of years (Lansing, 1996; National Science Foundation, n.d.; Wermasubun, 2005). Other examples exist in other parts of the world such as Africa or North America where indigenous people often have very close connections with water (Redmond, 2000/1; Sheridan & Longboat, 2006).

In Australia, indigenous people have a moral obligation to look after country, which includes water, on the surface as well as underground (Goode, 2003; Yu, 2000).

This moral obligation is clearly recognised in Dreamtime stories as well as cultural and spiritual activities (see 2.3.1.10). Other cultures also acknowledge such moral obligations of care. Often, landscapes are imbued with moral meaning, especially where the supernatural is intertwined with the landscape (Smith, 2000).

There is also a moral obligation to provide good quality drinking water to people, as was recognised in 9th century England (Strang, 2004) and recently reiterated by the international community through the Millennium Development Goals (MDG) (United Nations, 2000) and the World Health Organization (World Health Organization, 2004b). At its Millennium summit meeting in New York, in September 2000, the UN General Assembly passed a resolution, one of the goals of which is to halve by 2015 the proportion of people without access to safe water (United Nations, 2000) (see also the closely-related Right to Water outlined in section 2.2.1.1) Later, at the 2002 World Summit on Sustainable Development in Johannesburg, a similar target was set for sewers. "Lack of access to clean water and sanitation are widely seen as a violation of human rights and an affront to human dignity" (James, 2003 p.1).

The moral, the cultural and the natural have always been intimately related. In order to achieve sustainable outcomes a moral society has to provide adequate care for its members as well as its territory and all it contains. This includes care for future generations and those outside the sphere of immediate social relationships. An ethics of justice should be employed (Smith, 2000).

It can be argued that a moral obligation exists to look after water resources for immediate use and for long-term benefits, as well as for others who may depend on it in distant locations and in future times. This includes non-human life forms and ecosystems. However, a perceived dichotomy in the ethics of water may force a choice between humans and ecosystems, which can make it difficult "to develop consistent measures of ethicalness that can be used for deciding water allocations" (Acreman, 2001 p. 265). Recognition of the interconnectedness of humans and the natural environment at a fundamental level could reduce this problem: for example, water could be a common denominator in looking after the wellbeing of both at the same time. However, this requires understanding based on information and knowledge, and hence, knowledge-generating as well as disseminating activities play an important role.

2.2.1.8 Intellectual, Scientific and Educational Needs

Human uses of water include those for educational purposes as well as for research and scientific endeavour (Coffey, 1990), many of which are closely related to those outlined in previous sections. Wild, natural rivers and their catchments can be especially valuable for providing baseline data for environmental monitoring and information on natural systems function as well as ongoing fluvial and other geomorphic processes. "Natural river catchments can provide biogeographical information, and may contain sites of significance for geology, geomorphology, botany, zoology, archaeology, and other sciences. They also provide a store of genetic stock of the animal and plant species living in them" (Environment Australia, 1998 p.3).

In this context, rivers and other water bodies are of importance for the education of students, especially for those studying natural sciences, for whom learning can occur through field trips or recordings (print, audio-visual or electronic media) (Environment Australia, 1998). However, it can be argued that such education should be both society-wide and beyond the merely biophysical.

McAnally (2004) outlines the important role that water has played in philosophy over millennia in most cultures, while the detailed study of the water cycle, the different forms of water (solid, liquid and vapour) as well as its nature (e.g. as the universal liquid) can foster a 'water literacy' that goes far beyond the merely intellectual level (Schwenk, 1996). Indeed, throughout the centuries, various thinkers in the Western tradition have come to see water as not only the basis for physical life processes but also have found it to be a mediator for spirituality (Schwenk, 1996) (see also 2.2.1.11).

While the UNESCO itself, as well as the International Hydrological Programme (IHP) and the International Institute for Infrastructural, Hydraulic and Environmental Engineering (UNESCO IHE) have a mandate to support global education and capacity building for WM (UNESCO-IHP, 2003), Falkenmark and the Symposium Scientific Programme Committee (2005) highlight the dire need for educating politicians and the general public about the importance of water to all areas of life, which should include so-called 'green' water that refers to rainfall, soil moisture and water vapour. By extension, the values of water should be acknowledged much more widely in all types of scientific and intellectual endeavour.

It can be argued that water as the basis for all life and life processes should feature highly in all education, be it formal or informal, fostering a general 'water literacy'. This could help equip people to take informed action when and wherever required to support their lives and livelihoods and live in accord with local conditions.

2.2.1.9 Freedom of Choice and Action

Water can limit our ability to survive, to live in a certain area as well as limit our range of movements, and, hence, is central to freedom of choice and action. Without water there is no choice. Obviously, water also restricts where plants and animals can live and the amount as well as the timing of rainfall are crucial elements. This explains many of the socio-economic differences between countries with temperate or humid tropical climates and those with semi-arid tropical conditions (see 2.2.1.2); the latter being clearly disadvantaged in multiple ways (Falkenmark & the Symposium Scientific Programme Committee, 2005).

In addition, "freedom of choice and action is influenced by other constituents of wellbeing (as well as by other factors, notably education) and is also a precondition for achieving other components of wellbeing, particularly with respect to equity and fairness" (Millennium Ecosystem Assessment, 2005 p.v). For example, equity and fairness[11] as well as choice can be severely curtailed in big dam building in places such as India (Roy, 1999), China and Brazil. Often, many persons, including indigenous people, get displaced without adequate compensation, and lose their livelihoods, which are frequently tied to access to traditional lands, and sometimes, water (Roy, 1999). This may not only affect economic wellbeing (2.2.1.2) but also social identity (2.2.1.3), community cohesion (2.2.1.4) and the spiritual ties people have to the land and water.

Related to this are the issues of water transfer and the right to water. While a right to water for human survival and to maintain livelihoods has been acknowledged (section 2.2.1.1) the issue of rights to water for other living things (and non-living entities that need it for certain processes) continues to need addressing. This throws up a variety of questions indicating a real conundrum that may be difficult to resolve.

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[11] Equity and justice or fairness are sometimes used interchangeably if equity is defined very broadly, however, in psychological terms, equity is generally seen as one of many justice principles of which "equality (equal shares for all those within specified social boundaries), allocation according to merit or to contributions (achievements, investments, etc.) [or equity], and allocation according to needs" are the three most researched (Montada, 2003 section 3.1 paragraph 5).

For example, if a right to water were acknowledged not only for humans but other entities, who makes the decisions about their access to water and how can that be granted? This is related to intrinsic value and the issue of association of such value with an intrinsic right to water if this is necessary for survival or proper function.

Other questions related to rights to water refer to the extension of the basic right to water. For example: is it acceptable for people to choose to live anywhere and then expect to have sufficient water even if the environment and climate are not providing enough? To what extent do we have the right to transfer water to these areas just because it is technically possible? And where do such transfers or changes to the landscape and hydrology, such as dam building and groundwater extraction, leave the rights and needs of other living beings and non-living elements?

Such questions touch upon fundamental ethical, philosophical and spiritual questions that go beyond a concern about equity or rights, and cannot be resolved in this dissertation. However, some of the spiritual values of water can and will be explored.

2.2.1.10 Spiritual Meaning and Significance

Water has great spiritual meaning in many cultures and religions: many earlier cultures around the world revered water and water sources as sacred (Windling, 2005). Current Western culture has predominantly a 'resource' attitude to water, whereas in Europe in earlier times numerous sacred wells and springs existed, which often retained their sacred status as places of worship even though the localities may have been invaded by other cultures, e.g. the Romans (Strang, 2004). Although this tradition was not initially carried on by the early Christians, later the importance of these springs was acknowledged by the Church (Windling, 2005).

Today, most major religions still place great importance on water, primarily because of its cleansing and life-giving qualities. For example, water in Judaism is used for ritual cleansing as 'living' water - water that has not been contained before. In the Christian tradition water is important to the initiation ritual of baptisms (also a 'cleansing' function), but is generally separated from its surroundings and used mainly in a symbolic sense. In Islam water is important for cleansing before prayer but can be replaced by sand if no water is available (Abrams, 2000/1).

Other spiritual systems, religions and beliefs place much greater importance on water. This can be connected to specific water bodies or be much more generalised. In

the Hindu belief all water is sacred, with rivers being especially revered. The whole religion is based on water; the Ganga River in India is the holiest of seven rivers and fundamental to Hindu beliefs (The Water Page, 2000/1b). Japanese Shinto places great importance on ritual cleansing but also reveres springs and other natural phenomena, with waterfalls being sacred. Zoroastrians consider water important because of its purifying properties but also because it is a fundamental life element. Their belief is that water is sacred and not to be polluted by urinating, spitting or washing their hands in a river (Abrams, 2000/1).

For some indigenous peoples, such as the Australian Aborigines, water is so central to their beliefs that their culture could not exist without it (Strang, 2005; Yu, 2000). This includes surface expressions of water as well as groundwater (Goode, 2003) and is reflected in rituals and Dreamtime stories. Another example is the native American Mohawk culture where people and everything else (the landscape, plants, animals, etc.) are intricately intertwined not only physically but through a consciousness of oneness with everything (Sheridan & Longboat, 2006). Other examples from around the world are too numerous to mention here; however, it is clear that the importance of water is reflected in many cultures and spiritual systems, especially those of indigenous peoples.

Since water still has a sacred status in many cultures this can be problematic if at the same time it is treated as a commodity. Conversely, a spiritual connection can ensure that water is treated with respect and that pollution or other degradation is avoided or actively counteracted, as in the Zoroastrian tradition or some animistic tribes in Africa (Abrams, 2000/1; Redmond, 2000/1). Water Temples have played a central role in water allocation and irrigation of rice paddies in Bali for over a thousand years ensuring that rice production was sustainable (National Science Foundation, n.d.). However, there may also be perpetuation of inequality in the access to, control of and distribution of water through a culture, as is the case in parts of India, where the Hindu social hierarchy is based on notions of purity and pollution which determine and reinforce this inequality in relation to water (Joshi & Fawcett, 2001).

Burril (1997) points out that spiritual aspects are some of the most difficult to identify, evaluate and accommodate, with appropriate methodology not as yet well developed. The fundamental importance of water in some spiritual systems and cultures makes this particularly difficult and possibly contentious. The question is whether

evaluation is possible or even at all desirable in such a case; or if it were better accommodated through a different type of process.

This question can be extended to all the identified values of water, since many of them would be difficult to evaluate, with the interconnections between them adding another level of difficulty. While this does not preclude the identification of values in different WM settings and scenarios, it does highlight the inherent difficulties.

2.2.2 Conceptualisation of the Values of Water

Conceptualisation as a heuristic device can be valuable for communication. It may be useful to compose a conceptual framework that puts the importance of water in perspective and shows the relationships of the values of water, not only for cognitive and educational purposes but also to ensure that none of the issues are overlooked at a practical level.

> Conceptual frameworks are neither models nor theories. Models describe how things work, whereas theories explain phenomena. Conceptual frameworks do neither; rather they help to think about phenomena, to order material, revealing patterns - and pattern recognition typically leads to models and theories (Rapoport, 1985 p.256 cited in Berkes & Folke, 1998 p. 15).

The following framework is an attempt to illustrate the importance of water to all life and to illustrate the human relationships with water. The water framework in Figure 2.2 is based on the premises of life, which are the basic prerequisites without which life could not exist. The first is the non-biological environment (tan background), encompassing the universe that contains the planet Earth with its physical and chemical resources. These are not necessarily dependent on water although most would not exist without it and others are influenced and shaped by it when present (Ball, 2001; Marrin, 2002). Water is part of these resources, albeit arguably the single most important resource for life on this planet (Marrin, 2002; Ripl, 2003) (blue wavy shape).
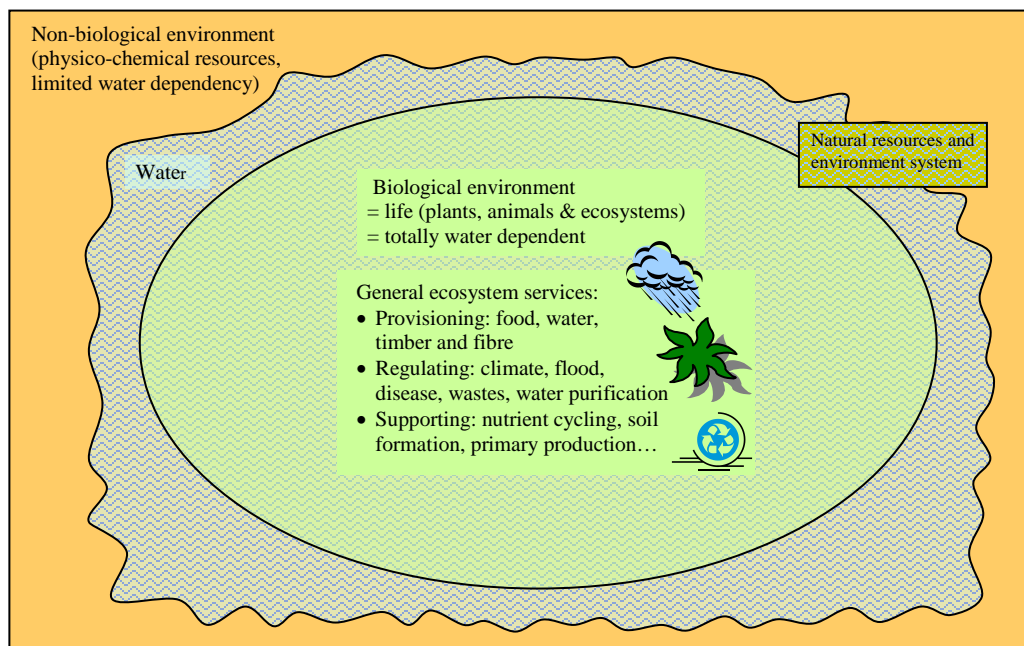
Figure 2.2: Natural Resources and Environment System Showing Relevant Ecosystem Services Identified by the MEA (Millennium Ecosystem Assessment, 2005 p.50)

Water is an essential prerequisite for life – without (liquid) water there is no life, at least not as we know it (see Section 5.2). Consequently, all biological and ecological systems (represented by the green oval), including humans, are directly and indirectly dependent on water (shown by the penetrating wavy pattern of the water shape). This whole array represents the natural resource and environment system on planet Earth that provides ecosystem services such as provisioning services (e.g. food, water, timber and fibre), regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment, 2005).

Arguably, all human endeavour, such as technology, science and economics, politics and culture, etc. are social in nature (e.g. Capra, 2003) (see section 3.2.1.2). Society is also important for human health, indeed for survival. "Without society, humans would not survive, as our very existence, in both evolutionary and present terms, is based on social interaction" (Giddings et al., 2002). However, some human aspects could be considered to be independent of society, such as those that satisfy basic human needs and many activities and factors related to wellbeing that are of an individual/psychological nature. Although such a distinction may be possible it is probably not very useful, especially in the pursuit of holism and the inherent interconnectedness of the individual with society. This supports the use of the term psychosocial, as suggested by Ovadia (2004).

The values of water as described previously have been combined into five areas (Figure 2.3): basic human needs requiring water (turquoise), water for wellbeing (pink), water used indirectly for basic human needs (blue), indirect water needs for infrastructure and technology (purple) and indirect social and moral water needs (orange). Besides being an integral part of the human system (yellow shape), and interacting with the other subsystems, these areas also interact with each other (shown by dashed lines). These water requirements are closely related to ecosystem services, e.g. provisioning and cultural ecosystem services as per MEA (Millennium Ecosystem Assessment, 2005).
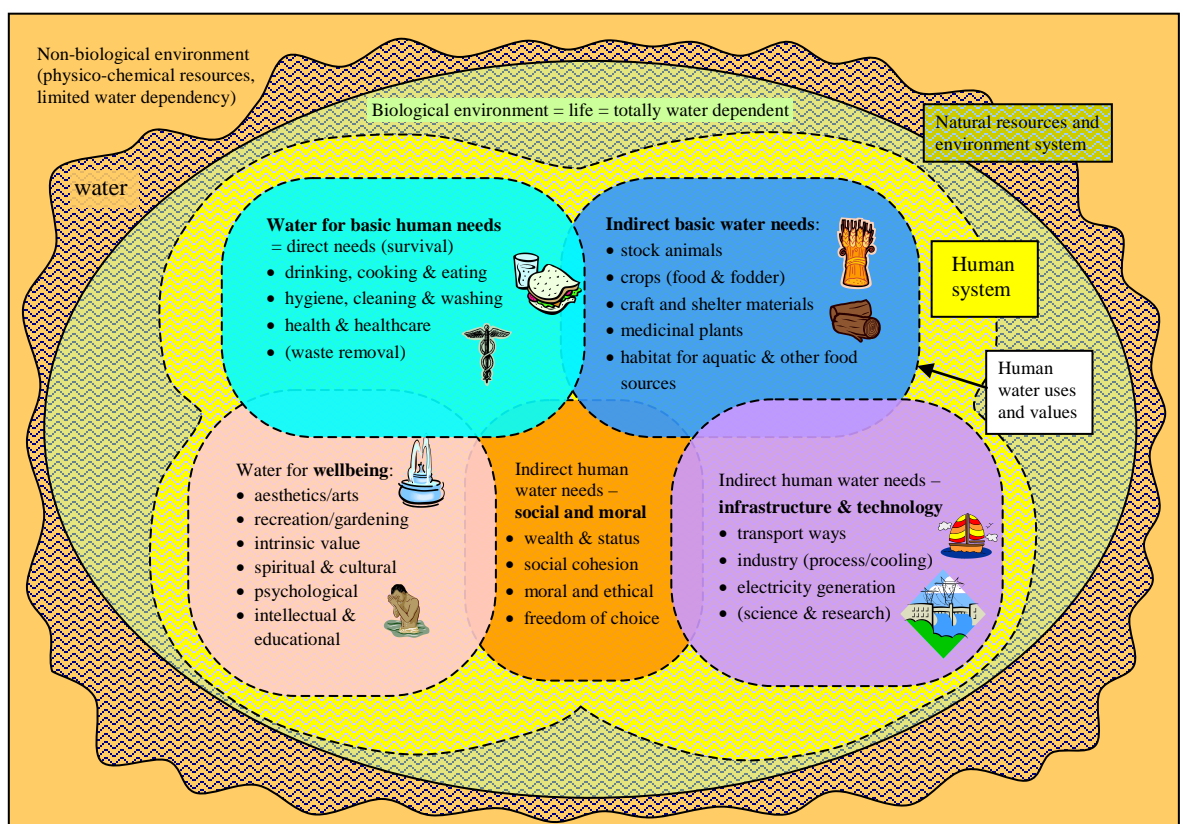
Figure 2.3: Water Values Embedded within the Human and Environment Systems

Water for basic human (survival and domestic) ***needs*** includes drinking, cooking and eating, hygiene (washing & bathing), cleaning and healthcare. Water for waste removal is also included here. Although survival is possible by simply taking care of these basic needs, additional needs have to be met for a truly healthy life (World Health Organisation, 1986). Gleick (1996) identifies basic human water requirements in four areas, drinking, sanitation, bathing and food preparation, and concludes that a minimum of 50 litres per person per day (l/p/d) should be provided for health and minimum quality of life. Gleick's categories are comparable to those identified in this

model although he does not make separate reference to washing of clothes and healthcare.

Water for *wellbeing* includes aesthetics and the arts, recreation, intrinsic value and psychological as well as spiritual aspects. It also includes intellectual and educational needs and has a large overlap with basic human water needs since wellbeing depends on the satisfaction of these needs.

Gleick (1996) maintains that water for food production needs to be considered separately from basic human water needs due to the difficulties of identifying these needs because of the vast differences in food preferences, climatic conditions, soil properties and other factors between countries and regions, as well as the transport of food from water-rich to water-poor areas. This is also true for other resources related to human survival, such as those used for shelter and other purposes, hence, water for *indirect basic human needs* includes water for stock animals and for crops (agriculture), for plants that provide craft and shelter material as well as medicines, water for prey animals, and water as habitat for fish and other aquatic food sources. Obviously, these water needs are closely linked to basic survival and wellbeing.

Other indirect water uses are related to *infrastructure and technology*. They include those for transport ways, industrial purposes and power generation (Wallace et al., 2003). Gleick (1996) mentions the use of water in industrial and commercial operations, as the cooling agent for power plants and for electricity generation. As these demands are associated with meeting human wants rather than needs they should be met only after basic human water needs (including water for food production and the environment) are satisfied (Gleick, 1996). Arguably, these indirect water needs are the least important for human survival, although they may have some overlap with all other spheres, and are obviously important for the modern Western economy and lifestyle. Research and science are also included here although these needs could be included in the wellbeing sphere since they serve in part to satisfy human curiosity, which is related to wellbeing.

The last category, indirect water *social and moral* water uses, is closely connected to all the others. Wealth has particular relationships with the previous type but so do cohesion and freedom of choice. Moral and ethical concerns are arguably more overarching and have a fundamental connection to such elements as access to water for basic needs, spiritual and cultural elements.

The model also shows that not all water can be used for human purposes. Gleick (1996) stresses that society has to take responsibility for protecting water-dependent species and ecosystems, especially in cases where impacts are irreversible. Clearly, not only so-called water-dependent species need water but all life forms depend on it for survival. Consequently, sufficient water has to be available for the life support systems to keep them intact and to ensure their survival[12]. The concept of water provisions for natural ecosystems was created to address this need (Gleick, 1996; Water and Rivers Commission, 2000); however, it is doubtful that this goes far enough in providing sufficient water for these systems (see Chapter 1).

Elements associated with water that are normally considered a cost are not included in the model. While they have to be considered in WM they are not easily accommodated in a values framework. Floods and droughts are examples since they often lead to a loss of lives, income and property. Associated costs also include that of specifically built infrastructure for flood protection or water collection, while the benefits of wetlands and floodplains in flood protection may be less obvious (Brody, Zahran, Maghelal, Grover & Highfield, 2007; Ogtrop, Hoekstra & Meulen, 2005).

Conversely, floods and droughts are normal parts of the water and ecological cycles and provide important functions and benefits, which are ecosystem services, and form part of the natural environment system. In the case of flooding the benefits are easier to appreciate, e.g. scouring of river beds, replenishing groundwater aquifers, providing breeding grounds for certain aquatic species and replenishing top soil (e.g. Balcombe, Bunn, Arthington et al., 2007; Barbier & Thompson, 1998; Kazama, Hagiwara, Ranjan & Sawamoto, 2007), while there seem to be no recognised benefits for droughts in the literature besides that of the change between the two and the associated variability (Gibbs, 2006).

This conceptual framework may be useful in helping to realise the extent to which humans depend on water and how valuable it is. It may assist in facilitating the change in humanity's approach to water resource management (and NRM in general) that is needed where the aim is to maintain life as well as quality of life.

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[12] This raises the issue of water rights for non-human entities, not only other life forms but also non-living entities (see section 2.2.1.9)

2.3 Concluding Thoughts on the Values of Water

Listing and conceptualising the values of water make it obvious that they are part of all areas of human life and endeavour, from basic water needs for survival and health to more intangible intellectual and spiritual needs. Many of these values are so closely interrelated and interact on so many levels that it is often hard to distinguish between them. While these values need to be identified for well-informed decision-making, separating them seems undesirable or even nonsensical. While difficult to envisage how it could be done differently, new approaches and thinking, such as that proposed by Gibbs (2006) regarding the value of variability of water in the landscape, may provide new opportunities.

Economic and environmental considerations clearly need to be part of informed water management as well as those effects or values indirectly connected to water that are not evident at first glance. The latter may be as important as those that are direct and, since they are not as obvious, may require more effort and investigation. For example, water is essential for ecosystem function and therefore provides indirectly for the many benefits humans derive from ecosystems such as resources (food, materials and medicines) or functions (flood protection, high water quality) and biodiversity support (Wallace et al., 2003).

In water management these indirect human uses and interests and their long-term benefits are often underestimated or neglected (Wallace et al., 2003). In addition, there are other indirect effects that are often ignored such as those deriving from the establishment of water markets or other water allocation decisions (see section 2.1.2.4). These include follow-on effects that can be substantial, be it with regard to lost livelihoods, disjointed communities or poverty traps. Other issues are more direct where allocation decisions, with regard to groundwater or surface water, can lead to changes in amenity and consequent losses of aesthetic and recreational values or raise Aboriginal cultural and spiritual concerns (Syme, Porter et al., 2004).

This may also be relevant to other cultures and religions, where it may be important for people to know that certain places that have particular spiritual meaning or are renowned for their beauty are maintained and managed appropriately so their values are protected although the people in question may never actually go there. A similar issue is that of intrinsic value, where it is important for many people to know that particular water bodies and sources not only persist but also remain in good

condition for their own sake. These issues and values also highlight that management of a local wetland or spring (or forest = indirectly dependent on water) may invoke much broader interest and with possible local repercussions.

The values of water, as identified in this chapter, highlight that most human activities depend on water and that human lives are utterly dependent on water, if not directly then indirectly. While there does not seem to be any disagreement about the fact that water is important to humans there appears to be limited acknowledgement of, and knowledge about, the magnitude of this importance; water is generally undervalued.

At the same time that water is undervalued and misunderstood, not surprisingly, competition for water can be intense. This is shown very clearly in NRM policies and practice, where usually only a subset of water values is considered at any given time. Arguably, in order to do justice to the values of water, they all need to be considered, while it is conceivable that some will be more important in certain situations than others, which is another issue for which a satisfactory solution has to be found.

Since values as such are a fundamental concept to understanding people, their attitudes and behaviours, and as a change in values can be instrumental in changing behaviour, it seems a possibility, and a logical conclusion, to use the values of water as a tool for attitudinal and social change in order to achieve better resource management outcomes. Such an idea should be based on current practices to increase the likelihood of its acceptance but would need to address shortcomings and problems of existing resource and water management concepts and practices to increase the potential for successful implementation.

There have been and are many attempts at addressing these issues, however, to date, their success has been limited. Two of the most prominent of these attempts are sustainability and integration but despite some achievements and increasing popularity their overall success remains partial.

Chapter 3
Sustainability and Water

3.1 Introduction

The realisation that a change in the approach to natural resource management is needed has resulted in the introduction of the concept of sustainable development or sustainability (e.g. Capra, 2003; Giddings et al., 2002; Tortajada, 2005; WCED, 1987). Already applied in Germany in the Middle Ages (Schmuck & Schultz, 2002a), this concept emerged again in the 1970s and has received worldwide recognition and increased in significance since the Brundtland report in 1987 and the UN Conference for Environment and Development in 1992 (Biswas & Tortajada, 2005; Loucks & Gladwell, 1999; WCED, 1987). Although the mythical Greek Earth Goddess Gaia, the Native American Indian myths (Dorcey, 1991) and the concept of sustainable catch in fisheries management introduced in the 1930s (Biswas & Tortajada, 2005) have espoused similar ideas before, the current renewed interest in sustainability stems from a growing public awareness of threats to the environment and the consequences for quality of life (Biswas & Tortajada, 2005; Loucks & Gladwell, 1999).

Sustainability as a concept is now popular worldwide and many NRM and WM initiatives are based on it; this is also the case in Australia. Unfortunately, progress has been hampered, despite the recognition of the importance of sustainability and some considerable efforts, good ideas and projects. This lack of progress may be particularly problematic for water allocation (see Chapter 1) indicating that there may be limits for sustainability to improve on the existing unsatisfactory WM situation. Hence, it seems important to find out why sustainability has not been fully successful and what is hindering its implementation, in order to ascertain what changes may be required and what would have to be considered or improved in future approaches to WM so as to be successful. Given the existing confusion about values in NRM and the lack of knowledge as well as the misunderstandings regarding the values of water, which, together, have led to a general undervaluation of water (Chapter 2), it is of particular interest to find out how sustainability deals with the full set of water values, and if and how this full set is accommodated.

Consequently, the aims of this chapter are:

- to identify the barriers to the implementation of sustainability and potential improvements for future approaches to water management;

- to ascertain the role of water in sustainability and if and how sustainability deals with all the values of water; and

- to determine what this means for the ability of sustainability to improve WM.

3.2 Sustainability and Barriers to Its Implementation

Examining the concept of sustainability, its application and implementation is complicated by the complexity and interconnection of all the areas relevant to sustainability, making the choice of analytical approach difficult. The typical division into economic, social and environmental aspects may not be suitable to identify the barriers to implementation of sustainability since this division is based on areas of application rather than being concerned with functionality or operational issues.

There have been attempts at categorising the barriers to sustainability, for example as 'perceptual/behavioural', 'institutional/structural' and 'economic/financial' (Donovan, Evans, Bryson, Porter & Hunt, 2005). While most issues identified in the literature seem to fit these categories quite well, closer inspection reveals that there may be a causal connection between some of the 'perceptual' aspects, which seem to be underlying issues that prevent 'resultant' aspects from being realised. Hence, here the distinction is made between 'underlying perceptual barriers' and 'resultant institutional, structural and procedural barriers'. The 'behavioural' component is considered to be part of the second category, which is concerned with activities.

These two categories were divided into sub-categories suited to the findings in the literature and refer, in the first case, to definitional issues, worldview and values, while the second category contains the four areas of 'political processes and structures'; 'integration and adaptability'; 'issues related to knowledge and capacity', and 'economics and finance'. The focus is on barriers to sustainability (see Table 4.2 for a summary) but some suggestions and potential solutions are also explored for each area and sub-category. Sorting these issues into separate themes was difficult due to the complexity, substantial interconnection and overlap between issues, and the resulting list neither claims to be definitive or exhaustive nor a satisfactory representation. First, the underlying perceptual issues are examined, followed by the resultant barriers.

3.2.1 Underlying Perceptual Barriers

There are many perceptual issues associated with sustainability. They are related to definitional matters and worldview, which in turn are linked to values and other socio-cultural aspects with potentially far-reaching effects. These barriers are deemed to be 'underlying' because all are instrumental to the success of sustainability in a fundamental way (the important connection with information and knowledge is explored further in section 3.2.4).

Since the definition of a concept sets the basic parameters, the clarity of a definition can contribute to and influence how the concept is interpreted and implemented. Too much room for interpretation invites controversy and misuse, while too narrow a definition may prevent adaptation to varying circumstances.

Worldview and attitude are clearly underlying issues since these constructs influence the interpretation of a concept and, furthermore, the activities that will follow. Values are included since, as we have already seen, they are considered to be at the root of all human concerns and a determinant of worldview and attitudes, which, in turn, influence behaviour (Rokeach, 1973).

3.2.1.1 Definition and Interpretations

There are many terms for sustainability and an Internet search (e.g. using Google) results in numerous pages of definitions. In general, sustainability promotes the maintenance of ecosystems while providing for the highest benefits to the current society and at the same time maintaining the potential for future generations to do the same (Wallace et al., 2003). Put slightly differently, "…the idea of sustainability is the persistence of certain necessary and desired characteristics of people, their communities and organisations, and the surrounding ecosystem over a very long period of time (indefinitely)" (Hardi & Zdan, 1997 p.8).

Most definitions represent a similar idea and many make reference to the integration of the ecological, social and economic realms. An example is the widely used term of the 'triple bottom line' coined by Elkington (1999) where the three prongs of the 'sustainability fork' represent economic prosperity, environmental quality and social justice. The lack of a single definition of sustainability (Loucks & Gladwell, 1999) – Holding and Tate (1996, cited in Youe & Tate, 1998) counted 160 of them – illustrates the ongoing debate about the concept and the difficulties of working with it.

The confusion regarding definitions of sustainability is compounded by the use of different terms. 'Sustainability', 'sustainable development' and 'ecologically sustainable development' are all employed, sometimes interchangeably. There seems to be a preference for specific terms in different organisations, with private sector and government bodies using 'sustainable development' because of the managerial and incremental emphasis (Robinson, 2004). According to Hardi and Zdan (1997) development implies the expansion or realisation of potential and the bringing about of a fuller, greater, or better state. It also has qualitative as well as quantitative aspects in contrast to growth, which refers only to a quantitative increase in physical dimensions. 'Sustainable development' then denotes a dynamic, evolutionary process and not a "fixed state of harmony" (Hardi & Zdan, 1997). NGOs and academics prefer the term 'sustainability' because of its connotations of living within environmental constraints with which the growth implied by 'development' is not commensurate (Robinson, 2004).[13]

Another debate has ensued about the number of areas to be considered in sustainability. Some authors argue that, besides the environmental, social and economic pillars of sustainability, there should be a fourth one – cultural diversity (Hawkes, 2001; Yencken & Wilkinson, 2000). This separation and inclusion of culture is supported by Albrow (1999) for whom culture depends on individuals that shape it and even more so on social relations and societies, while at the same time, it can also transform social relations. He argues that society is wedged between species, culture and environment.

Other authors also suggest a 'quadruple bottom line' but with 'institutions' as the fourth pillar, or simply 'good governance' (*Chairman's Summary of the Multi-stakeholder Dialogue*, 2002; China Economic Information Network, n.d.; Gardiner, n.d.). They maintain that institutions and mechanisms of governance underpin sustainable development (Halle, 2002). Expanding on this, the Canadian International Development Agency (CIDA) has adopted five pillars of sustainability - environmental, economic, political, social and cultural aspects (Canadian International Development Agency, 1997). Another, opposite, train of thought argues for a holistic, co-operative approach, striving for a 'single bottom line' that combines all the aspects of sustainability to avoid competition between different sectors (Brown, 2003b; Grootjans, Townsend, Butler & Heyworth, 2005).

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[13] The latter stance is adopted in this thesis and the term 'sustainability' is used throughout.

According to Kastenholz et al. (1996) societal consensus with regard to the concept is necessary so that strategies for its application can be successfully developed and sustainability can eventuate. However, it is difficult to see how consensus can be achieved given the contention surrounding sustainability and the many ideologies and worldviews that sustainability has to compete with (Connelly, 2007). Too broad an interpretation also would make it difficult to determine progress of sustainability (Loucks & Gladwell, 1999). For some, sustainability is too vague to be meaningful (Lafferty & Meadowcroft, 2000) while others are of the opinion that it is being misused (Connelly, 2007). For example, Denniss (2005) maintains that 'big business' and governments had first adopted the sustainability rhetoric to placate environmentalists and are now redefining the concept to suit their agenda to maintain the *status quo*.

Controversy and differences in interpretation and definition (Biswas & Tortajada, 2005; Giddings et al., 2002) are only some of the many reasons for the difficulties that surround sustainability and delay or prevent implementation. Overall, while the broad and vague definition(s) of sustainability may contribute to its popularity, the problems of defining and interpreting sustainability seem to be the surface expression of more far-reaching underlying issues that may not be resolved unless these fundamental causes are addressed. The whole debate surrounding sustainability may be detracting attention from the issue for which sustainability has arguably been conceived to deal with, that of economic gains at the expense of the environment and society. Since this is essentially an issue of worldview and associated attitudes and values, it will be difficult to resolve, as set out in the following section.

3.2.1.2 Worldview, attitudes and values

The existing discrepancies in the interpretation and use of the term and idea of sustainability are connected to differences in ideology, discipline and research traditions that influence theory and research but also extend into the strategies and instruments of application (Elkington, 1999; Kastenholz et al., 1996). Different definitions of sustainability have been attached to the varying attitudes and ethical stances people have towards the environment (Buchdahl & Raper, 1998). An anthropocentric position favours social and economic needs whereas a non-anthropocentric stance, which can either be biocentric (including all other forms of life) or ecocentric (including all life forms as well as all inanimate objects), prefers environmental protection to human needs (Attfield & Dell, 1996; Buchdahl & Raper, 1998).

Such difference in position can be recognised in the ongoing debate about so-called 'weak' and 'strong' sustainability. Weak sustainability identifies interchangeable forms of capital that need to be maintained in order to uphold a particular standard of living. It draws heavily on economic terminology and is often subscribed to by classical economists and the political mainstream. Definitions of human-made capital and natural capital vary considerably and are subject to ongoing debate (SCN, 2004).

> The weak notion of sustainability is intrinsically positivistic based on a strong faith in technology, normative science, and human ingenuity. Its supporters' view of the world is largely mechanistic, and nature is ascribed utilitarian values only, perceiving humanity as the exclusive locus of intrinsic value. The notion of weak sustainability interlocks with anthropocentrism, which represents the almost unchallenged, dominant social paradigm in Western society. (SCN, 2004 p. 11)

In contrast, advocates of strong sustainability reject the idea that natural capital can be replaced by human-made capital. This more ecocentric, holistic and integrative worldview rejects the notion of separation of humanity from the natural world that is perpetuated by economic rationalism and technocracy. Achieving sustainability is seen as contingent on radical social, political and economic reform (SCN, 2004).

This debate and the associated worldviews have been well represented in various models of sustainability. Sustainability is usually shown as the intersection of three circles that depict the environment, society and the economy (Figure 3.1), which does not integrate the sectors but separates them and gives autonomy to each (Giddings et al., 2002). According to Giddings et al. (2002) a great obstacle to achieving sustainable outcomes lies in this compartmentalisation because it opens up the possibility of one area being given greater priority over another, which is often the case, resulting in trade-offs that are generally not sustainable (Giddings et al., 2002).
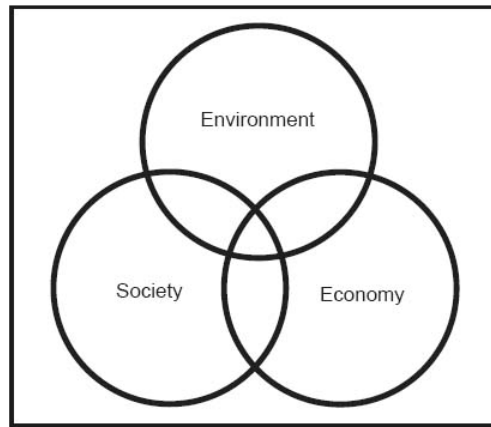
Figure 3.1: Common Three-ringed Overlapping Sustainability Model (Giddings et al., 2002 p. 189)

Usually, economy and technology are emphasised and broader societal concerns, such as policy priorities and issues in decision-making, are not addressed (Giddings et al., 2002). Lowe's (2004) diagram (Figure 3.2) depicts the current state of affairs in a neo-liberal system where the economy is the main player with society and environment tucked on as 'ears'. As Maser points out, "environmental protection is the *necessity to which economics must adapt* - not the other way around. Economics without humility is every bit as dangerous as science without morality" (1997 p. xiii, original emphasis). The separation of society from the environment is also depicted clearly, with the environment predominantly being a resource provider for society via the economy.
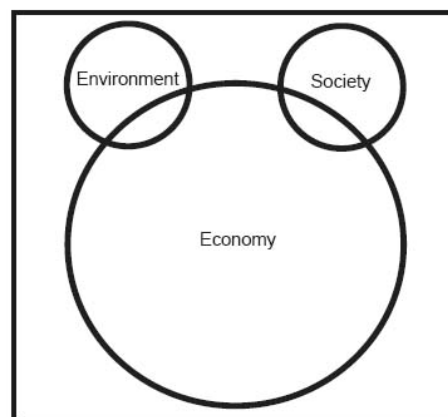
Figure 3.2: Current State of Play (pig-headed model according to Lowe, 2002a p.7)

Wellbeing is not only a function of consumption and material wealth but other factors which also need to be considered, such as the social and ecological effects of economic activity (Peet, 2004b). According to the Australian Institute of Health and

Welfare there are seven components to holistic health and wellbeing: biological and mental wellbeing; social wellbeing; economic wellbeing; environmental wellbeing; life satisfaction; spiritual or existential wellbeing; and other characteristics humans value (cited in Maller et al., 2006). Grant et al. (1996 p. 332) stated the basic priorities: "human development depends upon a healthy environment; economic vitality and social equity can follow only if ecosystems continue to thrive." Crowley and Walker (1999 p.1) put it similarly: "without ecology, there is no economy – and no human society"[14].

Consequently, a more appropriate sustainability model would be that of nested circles (Figure 3.3). It represents the notion that the economy is part of society, which again is part of the environment (Brunckhorst & Coop, 2001; Crowley & Walker, 1999; Lowe, 2002a). This 'evolutionary' view shows our dependence on the environment, which was there first, society then formed through interactions of people (this includes culture, which is created by people), and the economy is a tool devised by people.
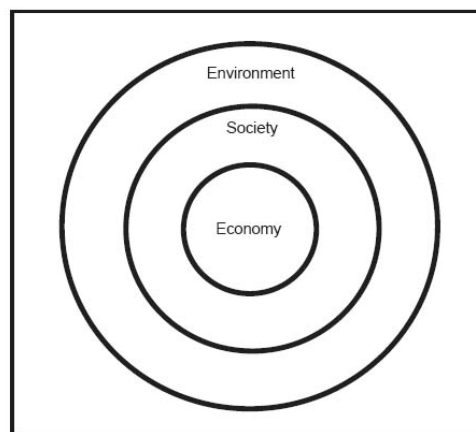
Figure 3.3: Nested Model of Sustainability (adapted from Giddings et al., 2002 p. 192)

However, Giddings et al. (2002) regard even this nested model as a dangerous simplification of reality since it ignores the multitude of societies, environments and economies that make up the real world. The authors suggest the removal of the boundary between the social and economic systems to form an area of 'human activity and wellbeing' (Giddings et al., 2002) (Figure 3.4). This confirms the view by Albrow (1999) who points out that all the sciences (including economics), and in fact everything

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[14] This reflects the first law of ecology by Commoner (1972): (1) 'everything is connected to everything else', (the others are (2) 'everything must go somewhere', (3) 'nature knows best' and (4) 'there is no

that people do, is embedded in society. Consequently, economics is an aspect of the social dimension, supported by the view that markets and the economy are essentially social institutions and prices are social phenomena (Zafirovski, 2004). Since culture is also a social phenomenon, the concept of sustainability is reduced to two aspects, ecological and social, while still acknowledging its anthropocentric origin.
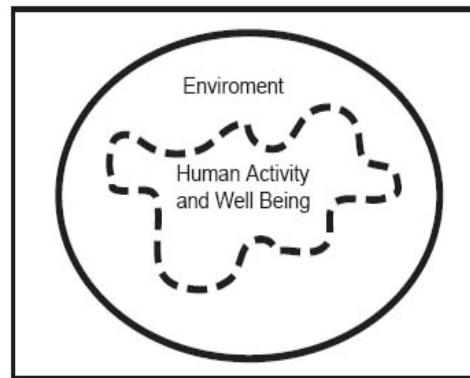
Figure 3.4: Sustainability Model According to Giddings et al. (2002 p.193)

Giddings et al. (2002) suggest that the boundary between the human layer and the natural world is 'fuzzy' and not clearly defined (Figure 3.4), while Berkes and Folke (2002) go further and consider the delineation between natural and social systems to be arbitrary and artificial; they prefer the term social-ecological system to illustrate the integration of humans and nature. Similarly, Capra (2003) outlines a systems or network view of the sustainable interaction of people and environment without a clear-cut hierarchy but with a premise of an intact and healthy environment that is diverse and widely interconnected. All systems need to work in a sustainable fashion, i.e. they should be highly efficient without the production of waste (Capra, 2003).

It is argued that this way of viewing the world would encourage a 'win-win' outlook and shift the focus on achieving human wellbeing and satisfying needs while keeping the whole system in mind (Attfield & Dell, 1996; Giddings et al., 2002). The key issue to achieving sustainability is the integration of the different areas through a holistic approach (Giddings et al., 2002) ensuring ongoing functional integrity of ecosystems and landscapes to support biodiversity, sustainable resources, economies and human quality of life (Brunckhorst & Coop, 2001).

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such thing as a free lunch')

Socio-cultural processes and norms need to be considered as well (Hamann & O'Riordan, 1999), since this interdependence of people and their surroundings implies "maintaining and preferably improving, both human and ecosystem wellbeing, not one at the expense of the other" (Hardi & Zdan, 1997 p.8). The importance of integration of ecological, economic and social processes lies in the expanding influences of human activities because they intensify the connection between people and natural systems and therefore neither can be understood in isolation (Carpenter, Brock & Ludwig, 2002; Vitousek, Mooney, Lubchenco & Melillo, 1997) (see next chapter).

Socio-cultural processes "related to networks of communication and trust … allow communities to engage with their local environment, as well as institutional structures in government and private economy, in order to enhance their livelihoods" (Hamann & O'Riordan, 1999 p. 2). This means that 'natural capital' and 'social capital' are two sides of one coin because "as social systems lose capacity to adapt and engage, biophysical systems are exploited and degraded, leading to further threats to communities" (Hamann & O'Riordan, 1999 p. 2). Hence, threats to the social order, such as crime, high unemployment and low education, are also threats to sustainability.

The Millennium Ecosystem Assessment (MEA) framework adopts the stance that humans are an integral part of ecosystems. It recognises the dynamic interaction between people and other elements of these ecosystems, where changes in human conditions drive changes in ecosystems, both directly and indirectly, which in turn influence human wellbeing (see figures on pp. vi and vii in the synthesis report). In addition, factors not directly related to ecosystems (social, economic and cultural) are recognised as influences on human conditions while ecosystems are also influenced by other natural forces. Although emphasising the human-ecosystem links the MEA acknowledges that human actions are not only based on concern for human wellbeing but also on consideration for intrinsic values of ecosystems and species (Millennium Ecosystem Assessment, 2005).

While the MEA models show the multiple and complex interrelationships of humans with the natural environment, the environment still appears to be external to humans and human concerns and institutions seem to outweigh the importance of an intact environment. Nevertheless, the MEA approach seems a step toward acknowledging the interdependence of humans with the environment, and a sustainable society, but translating these ideas into practice requires changes in the way society

functions and behaves, many of which have not even been initiated yet (Millennium Ecosystem Assessment, 2005). Changes will take time to implement while many obstacles will have to be overcome on the way towards such a sustainable society (see section 3.3).

> All these barriers are further compounded by weak human and institutional capacity related to the assessment and management of ecosystem services, underinvestment in the regulation and management of their use, lack of public awareness, and lack of awareness among decision-makers of both the threats posed by the degradation of ecosystem services and the opportunities that more sustainable management of ecosystems could provide. (Millennium Ecosystem Assessment, 2005 p.20)

Other limitations to achieving sustainability stem from people's worldviews or myths about nature (also partial representations of reality) which lead to different assumptions about stability, the processes affecting stability and appropriate policies. These worldviews need to be expanded in order to prepare the basis for achieving sustainable outcomes (Carpenter et al., 2002). Sustainability can be viewed as an indication of the emergence of a new worldview, the so-called emergent worldview (EWV), an expression of the recognition that the traditional worldview (TWV) is no longer appropriate and needs replacing (Dent, 1999). The associated attitudes and behaviour are at least in part determined by values (e.g. Schultz & Zelezny, 1999).

According to Milbrath (1989), for any society to work it must modify the innate selfishness of its members by promoting appropriate values. Modern industrial society may need to replace selfishness, competition and maximisation of wealth and growth with values based on cooperation, justice, compassion and empathy (Milbrath, 1989) as well as equity, durability and regard for future generations with a focus on meeting needs using fewer resources (Donovan et al., 2005; Lowe, 2004). Psychologists try to find ways of changing attitudes and behaviour to make sustainability work (Schmuck & Schultz, 2002b) (see Chapter 8).

A prerequisite for a sustainable society may be an appropriate structure, such as that proposed by Milbrath (1989) in which the core value is life in a viable ecosystem and all other values dependent on and are supportive of this. Such a set of values will change with time and will vary within and between communities (Hardi & Zdan, 1997). Nevertheless, a clarified values structure could be very useful for policy analysis and as a basis for environmental and social impact analysis. In addition, it could serve as a

stimulant for the re-examination of personal values and learning, while aiding in the resolution of values conflicts and dealing with our problems in general (Milbrath, 1989).

While a change in values seems unavoidable, there are problems with both the anthropocentric and the ecocentric positions in the way that they assign value, where "anthropocentric ethics fails to account adequately for the moral value of nonhuman nature" (Buchdahl & Raper, 1998 p.96) and non-anthropocentrism accepts an objectivist theory of value and intrinsic value in nature, which fails to explain where this value comes from and who assigns it. As noted in the previous chapter, only human beings (who have a 'unique ethical consciousness') assign value, projecting ethical judgments onto the natural world (Buchdahl & Raper, 1998). This reaffirms the need for clarification.

So far, we have established that the definition as well as the interpretation of sustainability is unclear, even contentious, and that this is to a large extent based on underlying differences in worldview, which can be profound. Perceivably, this will make difficult a change in worldview and associated values as required by sustainability, unless a clearer, more compelling and unifying notion can be found that is applicable at a societal as well as a personal level.

> If achieving sustainability requires fundamental changes to those social values and methods of social organisation and consumption, then this challenges entrenched social and economic power relations, which are even more difficult to change than individual behaviours. (Donovan et al., 2005 p.5)

For a sustainability worldview and matching values to be adopted, there will need to be suitable institutional structures and processes to help put this into action, which in turn may require adaptations to the political system. These are examined next.

3.2.2 Resultant Institutional, Structural and Procedural Barriers

While institutions and mechanisms of governance are required to support sustainability (Halle, 2002) inappropriate arrangements can hinder progress or even prevent implementation. The existing inappropriate arrangements can be seen as 'resultant' barriers caused by the current predominant worldview that pays lip service to sustainability without real interest in changing the *status quo*. Although this appears to be the main issue for the lack of implementation of sustainability, it does not mean that sustainability institutions, structures or processes that have been or may be put in place cannot have other issues that stand in the way of implementation.

Institutional and structural facets of sustainability relate to separation of functions and integration, regulation and accountability, existing cultural and power structures and associated social and political systems. Issues pertaining to information, knowledge, education and communication are included since they are the bases for the proper function of institutions and their processes. Political issues are dealt with next since they are closest to the underlying issues, essentially mediating implementation.

3.2.2.1 Leadership, Political Process and Structure

Essential ingredients for sustainability are leadership and appropriate management structures (Loucks & Gladwell, 1999). Clearly, it takes political will to allow the necessary leadership to emerge and establish appropriate structures (Mitchell, 1990). This necessitates a certain amount of political stability as well as a political system that allows or enables this to occur.

Sustainability as a function of various, sometimes opposing, goals and objectives can entail "multi-objective trade-offs in a multi-disciplinary and multi-participatory decision-making process" (Loucks & Gladwell, 1999 p. ix). This requires the consideration of conceptual and technical issues "within the context of the delicate value-driven processes of real, day-to-day decision-making. In this way, new insights can effectively be fed to decision-makers and conversely, the processes of assessment and decision-making can enhance technical and public inquiry. The process is a two-way street" (Hardi & Zdan, 1997 p. 9).

This means that all interested and impacted stakeholders need to be involved in a political process that also takes into consideration the needs of future stakeholders that may be impacted by today's decisions (Loucks & Gladwell, 1999). Since the move toward sustainability is based on social choice it is only possible if it involves all (or at least the vast majority of) members and organisations of society, both private and public. Hence, public participation is crucial for sustainability, although few appropriate avenues and processes are established at present (see also section 3.2.2.2).

The current political systems around the globe, despite some having been remarkably stable for a considerable time, generally preclude genuine public involvement and participation. This is obvious in dictatorships but even most so-called democracies are elitist at heart, replacing ongoing public involvement with infrequent elections of representatives who are not bound by their election promises in election

processes that are prone to biased outcomes. This situation may contribute to the growing alienation of the community from political institutions and processes, in turn precluding genuine participation (Donovan et al., 2005). This lack of political power is especially problematic for disadvantaged groups preventing them from meeting basic needs (Millennium Ecosystem Assessment, 2005).

This is clearly an untenable situation if sustainability is desired, requiring a change in political processes and structure, even a change in political system (see Chapter 8), since the current predominant neo-liberalism with its reliance on markets and "hands-off" government is perpetuating disempowerment and disparity, as well as disregard for the environment (McCarthy & Prudham, 2004) (see 3.2.1.2). Such transformations are notoriously difficult and slow, principally because there are many vested interests at stake, but also because the institutions are often resistant to change. The next section examines one of the reasons for this resistance: a lack of capacity in most institutions to deal appropriately with complexity and change.

3.2.2.2 Integration and Adaptability

Some of the institutional barriers to sustainability stem from institutions having discrete functions rather than integrative capacity, making cooperation at all levels difficult, between as well as within institutions (Donovan et al., 2005). The ranges of competing issues as well as the limits of their jurisdictions are other difficulties facing organisations that can curtail the innovation and change necessary for sustainable policies and solutions to emerge (Donovan et al., 2005).

The collaboration required by sustainability challenges the existing power structures and cultures of institutions, which can cause resistance to the implementation of sustainability (Donovan et al., 2005). Inappropriate institutional and governance arrangements include corruption and weak systems of regulation and accountability that hinder the progress of sustainability (Millennium Ecosystem Assessment, 2005) but can prove difficult to change because of vested interests.

Risk and uncertainty are closely connected to sustainability, and although we obviously cannot know the future, we can influence it (Loucks & Gladwell, 1999). Since nobody knows if the decisions and objectives of today are right for the future they should be reviewed regularly. Importantly, management systems designed today need to be adaptable to uncertainty regarding future changes in a resource (Loucks & Gladwell,

1999). Importantly, "… sustainability is a relative state" and "…achieving higher levels requires continual monitoring, adaptation and decision-making" (Loucks & Gladwell, 1999 p. 3).

Sustainability is not static, and change is inherent in a sustainable system; in fact, it is essential for a system to be sustainable. This can be explained with the help of systems theory. For instance, events in ecosystems flow in adaptive cycles at different speeds through four ecosystem functions; from an exploitation phase (r) with rapid growth, over a conservation (K) period, in which an equilibrium is reached, to a point where release (Ω) occurs, which is signified by slowing and breakdown, and, eventually, to reorganisation (α), which allows for novelty and creativity to emerge (Carpenter et al., 2002; Holling & Gunderson, 2002). This cycle repeats itself within the three dimensions of potential, connectedness and resilience and across a variety of scales. This repetition generates as well as maintains diversity (for a detailed description see Holling & Gunderson, 2002), which is of prime importance for sustainability.

The representation of systems as adaptive cycles allows the reconciliation of the paradoxes of "conservative versus creative nature, of sustainability versus creative change" (Carpenter et al., 2002 p. 40). The metaphor is applicable to, and useful for, describing ecological as well as social and economic systems, although important differences between those types of systems are recognised. Also, not all systems run through the full cycle, e.g. open-ocean or pelagic aquatic systems, while some human systems that reduce variability by foresight are able to manipulate this variability creatively (Carpenter et al., 2002). This human creativity as well as the differences between natural and human systems warrants further exploration.

While space and time are fundamental dimensions in both ecological and social systems, Berkes and Folke (2002) point out that social systems also have a third dimension - the ability to manipulate symbols, most obviously words. This extra third dimension of human systems has four elements: (1) the use of symbols and construction of meaning; (2) reflexivity and consciousness; (3) generation of expectations and use of foresight; and (4) novelty in response to uncertainty (Berkes & Folke, 2002). While these abilities create distinct advantages they also have drawbacks, which may help to provide insight into why sustainability is difficult to implement.

The first element enables abstraction and with it the creation of a 'virtual reality' that permits higher levels of self-organisation, allowing a human system to divorce itself

from space and time to some degree. Although this helps to anticipate surprises at the global level it increases the resilience of social systems, reducing the ability to respond to surprises and uncertainties at the local level (Berkes & Folke, 2002), as demonstrated through the case of climate change where the knowledge is there but action is lagging.

Reflexivity and consciousness, the second element, are both inherent to meaning structures, and facilitate maintenance of system integrity as well as adaptation to change. However, when dealing with complex environmental problems both abstraction and reflexivity are limited and when dealing with slow changes and probabilities decision-making becomes difficult. In contrast to natural systems that counter disturbance on a variety of time scales and through various mechanisms, humans are inclined to respond one element and time scale at a time, which limits success and creates spin-off problems that either require continuous problem solving or end in disaster (Berkes & Folke, 2002). Of the many possible examples, the case of groundwater pollution may be sufficiently illustrative.

Similarly, the third element, anticipation and foresight, allows for instantaneous responses and can help reduce instability in a social system. Nonetheless, there are many examples in human history where foresight has failed (Berkes & Folke, 2002), e.g. continuing deforestation of catchments.

Lastly, the unique property of human systems to counter uncertainty with innovation is central to dealing with surprises. It allows humans to transform the future in relatively little time compared to natural systems and includes technology that has allowed humans more than other species to extensively exploit resources. However, technology is generally linear, focused on single-scale problem solving, thereby often causing other problems on different scales creating positive feedback loops with severe side effects. Initial success in controlling a single variable eventually leads to erosion of resilience resulting in crisis and reformation (Berkes & Folke, 2002). Examples can be found throughout the resources literature and include dam building and sewage disposal.

Taken together, these four unique characteristics of human systems help "to explain the fundamental lack of responsiveness or adaptability to environmental signals that characterise much of natural resource management" (Berkes & Folke, 2002 p.119) and provide an explanation as to why sustainability is so difficult to implement. Many of the barriers to sustainability are directly or indirectly related to these human system traits, and although not providing a solution to humanity's many problems or the puzzle

of implementing sustainability, these attributes may hint at how to proceed – paying attention to our own shortcomings, learning to be more flexible and using multi-variate, multi-spatial approaches to address issues on various time scales.

Social learning has a central role to play in this change (Pahl-Wostl, 2002). A dynamic society that is flexible, adaptable and able to change easily "is likely to be more stable than a society that resists change" (Milbrath, 1989 p. 353), as would be expected from a resilience perspective (Holling & Gunderson, 2002). Societal change has also been described as a transition from one way of operating to another and "as a process of the co-evolution of markets, networks, institutions, technologies, policies, individual behaviour and autonomous trends from one relatively stable system state to another" (van der Brugge, Rotmans & Loorbach, 2005 p.166).

Although a transition can be relatively swift (e.g. Mao Tse Tung's China) it is normally a rather prolonged process of 25-50 years, in which this co-evolution occurs until a new, more stable state is reached (van der Brugge et al., 2005). So, a shift towards a new environmental paradigm that affects all aspects of life will take time (Milbrath, 1989) and is constrained by a general fear of change (Zanetell & Knuth, 2002), which can only be addressed by using a variety of approaches that include the general public as well as the public service (Davis, 1993).

Integration is not only problematic for institutions themselves but also for knowledge creation. Although all three fields of inquiry (environmental, social and economic) have their respective tested knowledge and understanding, integration cannot occur due to the limited, partial nature of that knowledge (Carpenter et al., 2002). Little information and knowledge is available in the areas of interaction (Millennium Ecosystem Assessment, 2005) and there is insufficient training in interdisciplinary and integrative thinking (G. Syme, personal communication, 2000) (see also Ripl, 2003), resulting in research with unsustainable outcomes in all disciplines.

3.2.2.3 Information and Knowledge, Capacity and Education

A lack of knowledge and understanding of sustainability in both the decision makers and the broader public seems related to a lack of information about environmental issues (Donovan et al., 2005). This includes: "insufficient knowledge (as well as the poor use of existing knowledge) concerning ecosystem services and management, policy, technological, behavioural, and institutional responses that could

enhance benefits from these services while conserving resources" (Millennium Ecosystem Assessment, 2005 p.20). This not only leads to unsustainable outcomes but also results in a lack of behavioural change and disempowerment to act in accordance with environmental problems, local or global (Donovan et al., 2005).

With regard to the environment, "… the existence of ecological knowledge and an understanding of how to respond to environmental change are prerequisites for the management and sustainable use of resources, biological diversity and ecosystems" (Berkes & Folke, 2002 p.123). These relationships are depicted in Figure 3.5 where management practices embedded in a nested set of institutions interact with nested ecological systems. The link between ecosystem and management practice, ecological knowledge and understanding of the ecosystem and its resource dynamics is critical for sustainable use. Only then can management practice and institutions "recognise, interpret and relate to ecosystem dynamics in a fashion that secures the flow of natural resources and ecosystem services" (Berkes & Folke, 2002 p.124).
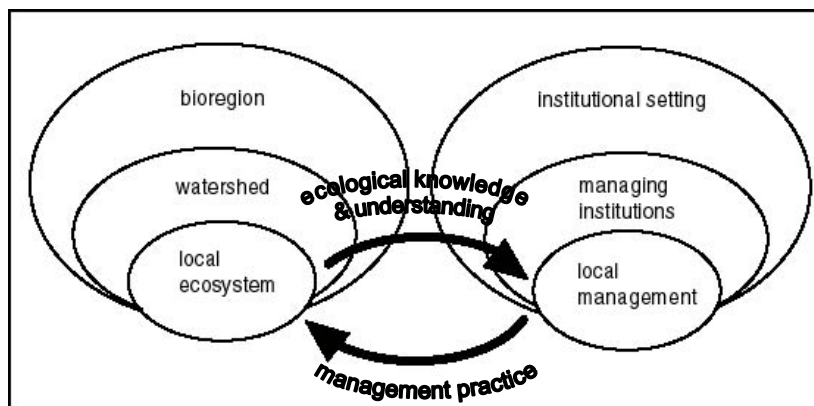
Figure 3.5: Conceptual framework for linked social-ecological systems (adapted from Berkes & Folke, 2002 p.124)

The importance of indicators to reveal the current situation and allow gauging of progress towards the above-stated goal has been recognised widely (Bell & Morse, 1999). However, it takes skill and discretion to find and use appropriate and meaningful indicators so that they can form part of a better set of tools necessary to deal with the great complexity of the systems (personal, social, economic and environmental) and their interactions in the long term (Peet, 2004a). This is only one example of why institutional capacity building and training of personnel are essential for sustainability.

Successful communication and information dissemination within and between institutions as well as to the general public are often problematic, leading to a lack of cooperation and collaboration that hinders integration. Using information and knowledge in a way that produces sustainable and integrated results requires the capacity to do so which is also often lacking (see section 3.2.2.2).

Prerequisites of capacity and capacity building are appropriate resources, which include people as well as material resources, such as premises and computers, but also financial support. The latter can also be a formidable barrier to sustainability.

3.2.2.4 Economic and Financial Considerations

Economic growth is often considered a fundamental policy issue by politicians, which fuels an over-emphasis on economic issues to the detriment of other aspects of sustainability (Donovan et al., 2005) (section 3.2.1.2). The current neo-liberal worldview and coupled economic system explain many problems with implementing sustainability, which are related to private property, markets, economic growth and profit thinking (McCarthy & Prudham, 2004).

The predominance of profit thinking and pursuit of continual economic growth has proved detrimental to the environment and society in many regions and countries, particularly in the third world (Jagger, 2002; Liverman & Vilas, 2006; McCarthy & Prudham, 2004). One of the reasons is that in neo-liberalism the environment seems to be viewed as a mere resource base, neglecting other values and social interests (Brohman, 1995; McCarthy & Prudham, 2004).

This will be difficult to change due to the interest of developers, investors, their shareholders and other stakeholders in safeguarding their investments, making sustainability only attractive as long as it does not negatively affect profits (Donovan et al., 2005). Such profit thinking and continued economic growth is associated with market failures and misalignment of economic incentives, which perpetuate environmental deterioration and growing disparity between rich and poor (Millennium Ecosystem Assessment, 2005).

Poverty can contribute to environmental degradation since people who are concerned with bare survival do not have the luxury of looking after the environment (Biswas & Tortajada, 2005) and may overexploit ecosystems since this may be the only source of subsistence or livelihood in the absence of money. New developments in

economic theory reflect the recognition that economics can only contribute to sustainability if used to achieve wellbeing for people in the short and long term (Peet, 2004b); any increasing disparity between rich and poor is an economic barrier to sustainability (Millennium Ecosystem Assessment, 2005).

> These days, water is postulated as a guiding principle in spatial planning, meaning that water is one of the dominating issues in spatial planning processes. The ecological functions and values of water have become more important at the cost of the agricultural function and economic value of water (Kamphuis, personal communication). This is illustrated by emerging metaphors and mantras in the Dutch water arena such as "Room for water", "From Stemming to Accommodating water" and "Water as a friend rather than an enemy", indicating the significant changes in current water management. (van der Brugge et al., 2005)

Funding arrangements and lack of funds are also significant barriers to the implementation of sustainability (Donovan et al., 2005). This includes "underinvestment in the development and diffusion of technologies that could increase efficiency of use of ecosystem services and reduce harmful impacts of various drivers of ecosystem change" but also "underinvestment in the regulation and management" of the use of ecosystem services (Millennium Ecosystem Assessment, 2005 p.20).

In order to be sustainable, economic activity has to take place within ecological constraints (Kinrade, 1995; Yencken & Wilkinson, 2000), i.e. it must be ecologically responsible. Ecological responsibility and sustainability can be economically viable, and good environmental management and many forms of economic growth can be compatible since there is no fundamental conflict between economic and environmental values, albeit, some low levels of environmental impacts may be unavoidable (Crowley & Walker, 1999).

Increasing the level of sustainability may be associated with costs or a reduction of benefits for today's people. These costs are often less than those of repair and restoration later and the challenge is to create incentives to change behaviour accordingly. This may include more effective and efficient use of resources so that economic development can continue in a finite world, but in the direction of increased quality of life rather than quantity of material goods (Loucks & Gladwell, 1999).

A sustainable economy can only be realised if there is continued adaptation, creation, and innovation, the implementation of new knowledge, new attitudes

and new technologies and new operation policies to the betterment of humans and their environment. (Loucks & Gladwell, 1999 p. 9)

This statement sums up much of what has been examined in the preceding sections. It also shows how intertwined are the areas that need to be considered in sustainability and how much change is required to make sustainability a reality. The question is whether it can be done and if so, how. There is no shortage of ideas of what a sustainability society could look like.

3.3 Suggestions for a Sustainable Society

An assortment of ideas exists on what a sustainable society should or could look like and what should change. For example, Milbrath (1989) proposes that the goals of such a society might be to achieve high quality of life, sustaining well-functioning ecosystems and a 'good' society that includes participatory community and an appropriate political system. Capra (2005 p.xiii) put it thus: "since the outstanding characteristics of the biosphere is its inherent ability to sustain life, a sustainable human community must be designed in such a manner that its way of life, technologies, and social institutions honour, support, and cooperate with nature's inherent ability to sustain life."

Similarly, Lowe (2004; 2005) suggested that the aim should be a **HEALTHIER** future - one that is **H**umane, has an **E**cocentric **A**pproach with a **L**ong **T**ime **H**orizon, and is **I**nnovative, **E**fficient and **R**esourced. The elements are explained as such:

- **H**umane: technologies and approaches that can be extended to the entire human community rather than only a privileged minority in a small group of countries.
- **E**cocentric **A**pproach: the future of humanity is intertwined with that of the natural systems of the planet, their biodiversity and ecological integrity. Those systems provide us with breathable air, potable water, nutritious food, cultural identity and spiritual sustenance; therefore, we need to set our social and economic planning within the limits of natural systems. A precautionary approach is warranted in cases of uncertainty since our present knowledge of those systems is still limited.
- **L**ong **T**ime **H**orizon: our decisions have impacts for many decades to come; thinking in 50-year timeframes should be routine.
- **I**nnovative: **I**nformed because we are still alarmingly ignorant of the natural world.

- **E**fficient: we need to learn to use resources and energy much more efficiently because much of the technology we use today is still alarmingly primitive.
- **R**esourced: we need to plan ahead for smooth transitions from resources that are diminishing (e.g. oil) to those that are abundant (e.g. solar radiation).

Likewise, Ripl (2003) argues that society's approach should change from one of net production to one "whose strategy is characterised by the maintenance of the steady state, where water and matter cycles are to be closed and the function of ever-continuing 'growth' reduced to that of improving relations within society, life quality and sustainability" (Ripl, 2003 p.1929). This entails all planning being spatio-temporal and taking into account system-immanent cycles with the aim to reinstate dynamic structures with minimised irreversible losses. Additionally, resource management must be adaptive and respect existing life cycles, aimed at local provision of water cycles, energy, food and other crucial environmental services, such as soil fertility, thermostasis and atmospheric distribution of matter (Ripl, 2003). More detailed suggestions include "decentralized self-sufficient structures for subsistence" (Ripl, 2003 p.1931) and new professionals and integrated training for resource managers who are "able to integrate all subsistence functions within a certain managed area" (Ripl, 2003 p.1931).

A stabilised population and *per capita* resource consumption at much lower levels than currently displayed in the industrialised world are also mandatory to achieve sustainability. "I think all new developments should be biodiversity positive; in other words, where it is seen as being in the community's interest to destroy habitat, the approval should be contingent on a compensating investment in restoration or enhancement of habitat elsewhere. … All large projects should be designed to be energy, water and waste neutral" (Lowe, 2004 p.5). Much of this seems to depend on the realisation that human wellbeing depends on ecosystems and the services they provide (Millennium Ecosystem Assessment, 2005).

> Arguably, sustainability has an inexorable logic, on a plane with other deep social logics such as democracy, justice, and human rights. Inevitably, it seems, these central animating ideas of modern societies are all intertwined and inseparable. Sustainability has yet to attain the status of its natural partners at national or global levels. This will require both broad normative change and purposive institutional change. (Connor & Dovers, 2002 p.3)

Although all these suggestions clearly hint at the possibility of a more sustainable society and future, they do not provide ideas of *how* these changes can be

achieved and *how* the underlying barriers outlined in section 3.2.1 can be addressed. Some insights can be glimpsed from Milbrath (1989):

> We will not fully preserve our own lives, and live them with high quality, until we transform our ways of thinking, our society, and our civilization. We have two vital human qualities to assist us in that mammoth task, our reason and our compassion. Changing our way of thinking is the first step in changing a civilization. (p.87)

It was suggested that this change could be derived from a new-found re-enchantment with nature or a form of humanism that changes the way we interact with our environment and also what we expect from it (Lowe, 2004). Since this thesis is concerned with WM, and water is an integral part of the environment, a look at how sustainability deals with water and the values of water may give some more clues.

3.4 The Role of Water in Sustainability

Overall, the importance of water for sustainability and the necessity to adjust societal activities accordingly seems to be well recognised.

> A sustainable and secure society is one that meets its water needs without destroying the ecosystems upon which it depends or the prospects of generations yet to come. The good news is that it is possible to achieve this goal. (Postel & Vickers, 2004 p.47)

Sustainable water resource systems are central to sustainability in general; however, all stakeholders need to be involved in determining what this means in detail for a region's economic and social sustainable development (Loucks & Gladwell, 1999). With regard to a changing environment, economy, social preferences and institutions it is important to consider appropriate spatial and temporal scales when developing sustainability criteria for water (Loucks & Gladwell, 1999).

Healthy ecosystems not only require minimum amounts of water and water of sufficient quality but also water flow patterns that resemble natural flow regimens, since many species depend on certain cues, such as floods or other cyclic events, in their life cycles (Postel & Vickers, 2004). This also means that meeting continually rising demands for water can no longer be an option. The aim must be an optimal balance between supplying water for human needs as well as those of ecosystems and their functions. Sufficient water for ecosystem functions throughout the year should be the

priority and then the remaining water can be distributed for human uses in an efficient, equitable and productive manner (Postel & Vickers, 2004).

> Setting limits on the use of rivers and other freshwater ecosystems is the key for sustainable economic progress because it protects the ecosystems underpinning the economy while spurring improvements in water productivity – the net benefit derived from each unit of water extracted from the natural environment. (Postel & Vickers, 2004 p. 48)

Overall, sustainable economic models need to align with the basic role of water as the 'bloodstream' of life (Falkenmark & Folke, 2002; Folke, 2003; Ripl, 2003). In fact, industrialised societies need "to decide now if they want to contribute to and to survive in a sustainable world. A world with a hierarchical adaptive process order given by the energy-dissipative properties of water, controlled and improved by humans" (Ripl, 2003 p.1933). Folke's (2003) realisation that land and water management are so intertwined as to be inseparable for all intents and purposes would imply that looking after water takes care of the wellbeing and function of the land as well.

The MEA (2005 p.v) clearly states this connection:

> Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling. … The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services.

A closer look reveals that water is essential to all of these, which means that a sustainable society would need to maintain functional water cycles and water assets as a priority with the benefits flowing to all six areas (Falkenmark & Folke, 2002). Ripl (2003 p.1933) has summed it up: "water, with all its many properties, could turn into the most crucial criterion deciding the life and death of landscapes and societies – as, of course, it has always been". The close relationship to the full set of water values is obvious, indicating that the values of water (see Chapter 2) should be useful as a guide for sustainable water management.

3.5 Overcoming the Barriers to Sustainability

Clearly, questions remain as to how successful the implementation of sustainability is currently and whether truly sustainable outcomes can be achieved,

given the different approaches and interpretations, barriers and inadequacies described above. Besides the definitional issues and the differences in interpretation of sustainability, the debate on *how* to integrate the three (or even four or more) areas of sustainability and their associated indicators is ongoing (Morse, McNamara, Acholo & Okwoli, 2001; Syme, 2002). To date, most attempts at integration have short-changed at least one of the three areas of ecology, economy and society (Lowe, 2002b), and, as various authors in Biswas and Tortajada (2005) argue, the concept so far has not been successfully put into practice and it has been questioned whether a single paradigm can deal with the existing cultural diversity and differences in worldview and social systems.

While sustainability provides a new view of the world that brings together many previously unrelated ideas and disciplines, "those using this perspective, including the Brundtland Commission and participants at the Earth Summit among many others, have come to the conclusion that the current nature of human activity is inadequate for meeting current needs and is seriously undermining opportunities for future generations" (Hardi & Zdan, 1997 p.9). Worryingly, the latest assessments of the state of the biosphere and its resources paint a less than desirable picture of the present situation (Millennium Ecosystem Assessment, 2005; UNEP, 2007).

Although the idea of sustainability was, and still is, spreading and is reportedly being used as the basis for strategies, policies and development initiatives (Lafferty & Meadowcroft, 2000) as well as for products, processes, companies, industry sectors or even entire economies (Elkington, 1999), overall, it seems that implementation is inadequate. An apparent discrepancy between rhetoric and results seems to reflect the definitional and interpretational barriers to sustainability outlined above, while the main underlying barrier, a worldview expressed through neo-liberal ideas and values, seems to be instrumental in other barriers to sustainability not being addressed, such as the political and institutional aspects, capacity and financial issues. In fact, neo-liberalism has been named as the single political ideology that has prevented sustainability from being implemented (McCarthy & Prudham, 2004).

Compromises can be achieved through the political process but this can only be successful in the long term if the integrated character of nature and people is recognised (Carpenter et al., 2002). Lack of recognition of the environment as a central component

of sustainability, or better, the environment as the basis for sustainability, is the reason for its neglect on the political agenda of the world's nations (Rast & Holland, 2003).

What this means is that without humans reconsidering their place within the biosphere and their relationship with nature (particularly in Western societies) (Milbrath, 1989; Reitan, 2005) as well as the consequences of their activities (Hardi & Zdan, 1997; Reitan, 2005), an idea such as sustainability will not become reality. In short, a change of worldview is required (Reitan, 2005) associated with a change in attitude and economic, ecological and social behaviour within the present generation (Keiner, 2004; Peet, 2004a; Reitan, 2005), that is translated into action.

The host of changes that will have to occur before sustainability can be fully accomplished, as well as explanations of why human systems behave the way they do, getting us to where we are today, is discouraging and the question may be asked if humans will actually be able to live sustainably. However, there are examples of cultures that have lived, and still live, sustainably, at least at a local level (see Chapter 2). Human ingenuity has found solutions for many problems and the groundswell for change is growing (see Chapter 8). The question then is: how can a change in (Western) society's thinking be achieved? And how can this be transformed into appropriate attitudes, values and a worldview that translates into appropriate and timely action?

A suggestion that the existing approach and current attitude to sustainability needs to change or be overhauled in order to improve the situation (Adams, 2006) is but the start of an answer to these questions, as is the realisation that: "sustainability demands, above all, a cultural transition in the form of an emerging sustainability culture that views humans as an inextricable part of the making of their own social-ecological system" (Tàbara & Pahl-Wostl, 2007 p.6). However, to make progress, the idea of looking outside sustainability for an answer (Adams, 2006) may be worth pursuing. Sustainability is not the only approach that is aiming at improving conditions for humans on planet Earth (or keeping conditions from deteriorating to unacceptable levels) and one of these, integrated water management which pivots around water and focuses on integration, will be examined in the next chapter.

Chapter 4
Integration and Integrated Water Management

4.1 Introduction

Integration of environmental, social and economic aspects has been identified as paramount in water management by many authors and organisations (*4th World Water Forum Ministerial Declaration*, 2006; Bellamy, McDonald, Syme & Butterworth, 1999; Falkenmark, Gottschalk, Lundqvist & Wouters, 2004; Giordano & Wolf, 2001; Kakabadse, 2003; Rhoades, 2000; Syme & Nancarrow, 2002; The Federal Government of Germany, 2001; The Secretariat of the 3rd World Water Forum, 2003a; UNESCO-WWAP, 2006; UNESCO World Water Assessment Programme, 2003). Water managers are increasingly recognising the intimate connection of water with ecosystems and human systems, which is why integrated water management is growing in popularity around the world (Falkenmark, 2003b). Although integration is not used only for water management, this is the area in which it is most widely applied, and since the focus of this thesis is on water, integration is explored in the context of water management.

In an attempt to improve water management and make it more sustainable, integrated approaches were introduced in England and Wales, France, Canada, New Zealand, and Australia in the 1990s (Mitchell, 1990). Integrated water management (IWM)[15] has also been used in the US for some time (Giordano & Wolf, 2001) and is currently promoted in many developing countries, mainly in Asia, but also elsewhere (Rhoades, 2000). This includes Australia where integrated catchment management is practiced throughout the country (Ewing, Grayson & Argent, 2000; Grayson, Ewing, Argent, Finlayson & McMahon, 2000).

Recent criticism of IWM and its implementation (Medema & Jeffrey, 2007), especially in the developing world (e.g. Biswas, 2005; Varis, 2005), warrants a closer look at integration, its practice and implications as well as advantages and shortcomings, to establish if it actually achieves its claims to make WM more sustainable or aids in implementing sustainable WM.

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[15] The term 'integrated water management' (IWM) is used in this thesis since it is considered to be the broadest of the different terms without reducing water to a resource or restricting it spatially; IWM is used

Hence, the aims of this chapter are in line with, and follow on from, those of the previous chapter:

- to review the current practice of integration in WM and to ascertain if and how integration deals with all the values of water;
- to identify the barriers to implementation of IWM;
- to establish the merit of integration and to establish the potential of overcoming the barriers to its implementation;
- to compare the barriers to implementation of both IWM and sustainability, and
- to ascertain their potential for the improvement of WM.

Since integrated water management explicitly deals with water, the following examination will be more focussed than that on sustainability, taking water into account throughout. However, the investigation concentrates on common themes, using the same thematic framework as in Chapter 3, allowing for comparisons and conclusions.

This inquiry looks at integrated approaches to water management in general, be it in policy, legislation, management frameworks and programmes or initiatives that profess to employ it. It can apply to water in liquid form, as a resource, or in the form of water bodies or a geo-hydrological unit, such as a catchment. All the assorted 'forms' of integration (see 4.2.1) are considered without differentiation.

A sizable portion of the literature used in this chapter is concerned with developing countries since there appears to be a more critical attitude towards integration. This may be connected to cultural and geopolitical differences although the issues and problems addressed in these publications seem to be valid for other countries, including Australia. In addition, there appears to be limited literature available that deals with integration in a critical or evaluative manner in Western countries, where integration seems to be more or less accepted and the focus is on project set-up rather than on evaluation.[16] Only recently have there been some publications in Australia and elsewhere that question IWM.

First, a background of IWM outlines the idea and gives an historical overview. The exploration of the barriers to implementation of IWM then forms the basis for

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here in an encompassing sense and includes IWRM, IWM and IWRMD, while acknowledging that IWRM is the term used most often and some differences in definition and scope exist between terms.

[16] A German review of gender related research has highlighted that WM in Europe is male dominated and that it may be 'blinkered' in its perception of success (Schultz, Hummel, Empacher et al., 2001), which

suggestions of the usefulness of integration for WM and its potential to overcome the barriers.

4.2 Origins and Development of the IWM Concept

The following overview illustrates the recent global phenomenon of a more integrated approach to WM, and also hints at some of its problems. The earlier parts of this description of the history of IWM draw mainly on Rahaman and Varis (2005) while other sources have been added where possible.

The historical origin of the concept of IWM dates back centuries. The precursors to IWM were institutionalised in various countries, such as in Spain, where multi-stakeholder participatory water tribunals were in operation since the tenth century. In 1926, Spain was one of the first countries to organise water resource management on the basis of river basins. In the USA of the 1940s, the Tennessee Valley Authority (TVA) was an early representative of an organisation committed to IWM. In 1960, the state of Hessen, Germany, adopted IWM planning based on a multidisciplinary integrated approach (Rahaman & Varis, 2005).

The first global recognition and recommendation of IWM came at the United Nations Conference on Water in Mar del Plata in 1977, where it was seen as a way to incorporate the multiple and competing uses of water. During the 1980s water played a minor role on the international political agenda but was resurrected in the 1990s by the International Conference on Water and Environment in Dublin (1992). It then received a boost in the 2000s with a series of meetings. The Second World Water Forum in The Hague (2000) and the International Conference on Freshwater (2001) in Bonn, the World Summit on Sustainable Development (WSSD) (2002) and the Third World Water Forum, Kyoto (2003) put IWM firmly on the global agenda (Rahaman & Varis, 2005). Following that, the Fourth World Water Forum was held in Mexico in 2006 consolidating the commitment to IWM (*4th World Water Forum Ministerial Declaration*, 2006).

In Mar del Plata in 1977 the key issue was to consider water management "on a holistic and comprehensive basis" (Rahaman & Varis, 2005 p.1). The *Mar del Plata Action Plan* made recommendations that comprise all essential elements of water

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could explain the dearth of critical WM (research) publications in Europe and those that question the success of integration.

management and twelve resolutions (Rahaman & Varis, 2005). The conference is considered a yardstick for IWM, but lacked reference to transboundary water resource management and an implementation scheme for the Action Plan (Rahaman & Varis, 2005).

The subsequent 1992 Dublin conference was the subject of criticism by water professionals and officials especially from the developing world, since it was a meeting of experts rather than one of government representatives, and neglected to consider the outcomes of the Mar del Plata conference. There was also limited participation from the developing world and lack of guidance for implementation (Rahaman & Varis, 2005). The conference resulted in the Dublin Principles (see Box 4.1), which themselves were criticised[17], but are still a major influence on current thinking about critical issues in IWM (Rahaman & Varis, 2005). The Dublin conference was successful insofar as it directed attention towards the necessity of IWM and the active involvement of stakeholders from all areas – the highest government levels to local communities – while highlighting the role of women (Rahaman & Varis, 2005).

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[17] The fourth principle of the economic value of water was opposed by water professionals from the developing world on the grounds that a focus on economic values would lead to unsustainable outcomes if equity and poverty considerations were neglected.

Box 4.1: The Dublin Principles are the Basis for Recommendations for Action set out in the Conference Report (*The Dublin Statement*, 1992).

The principles and other recommendations from the Dublin conference were incorporated into Chapter 18 of Agenda 21 at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 (Rahaman & Varis, 2005) and the four principles are recognised by the Global Water Partnership as the Principles of IWRM (GWP TAC, 2000).

The shortcomings of the Dublin Principles were addressed in the 2000 Second World Water Forum and its concurrent Ministerial Conference in The Hague (Rahaman & Varis, 2005) where developing countries were fully represented. The Ministerial Declaration called for all values of water, economic, social, environmental and cultural to be reflected in management, while equity concerns in full-cost water pricing for services were suggested through subsidies for the poor. Important components mentioned were: meeting basic water and sanitation needs and achieving food security, people empowerment, (especially of women, previously overlooked) through participation, ecosystem protection, risk management with regard to water related hazards, peaceful sharing of water at all levels within and across boundaries, as well as

wise governance (*Ministerial Declaration of The Hague*, 2000; Rahaman & Varis, 2005). IWM was considered the base for all of these components, taking into account social, economic and environmental factors and integrating surface and groundwater as well as the associated ecosystems with special consideration of water quality (*Ministerial Declaration of The Hague*, 2000).

There was clear recognition of the importance of collaboration and partnerships at all levels (from individuals to international organisations) in achieving water security and sustainable water resources, as well as developing "a stronger water culture through greater awareness and commitment" (*Ministerial Declaration of The Hague*, 2000 p.2). Coherent policies, as appropriate, were recommended to overcome fragmentation and allow for transparency and accountability (*Ministerial Declaration of The Hague*, 2000). Research and knowledge sharing, education and co-ordination, technology transfer and capacity building are central to this. Pollution control was seen as important, as was continued work within multilateral institutions, especially in the UN system (*Ministerial Declaration of The Hague*, 2000). Also called for were institutional, technological and financial innovations as well as meaningful participation of stakeholders, and the setting of targets, establishment of strategies and transparent water governance (Rahaman & Varis, 2005).

The *World Water Vision* (WWV) (which was compiled through consultation with over 15 000 people over 2 years) was presented at The Hague, and the Ministerial Declaration seems to be based on that document. The WWV Report subtitled *Making Water Everybody's Business* acknowledges that every woman, man and child has responsibility for water (Cosgrove & Rijsberman, 2000). Right to land and access to water were recognised as instrumental in ending poverty as was empowering people, particularly women, through a participatory process (Rahaman & Varis, 2005).

The major achievements of the Second World Water Forum include putting IWM on the global political agenda and the active participation of developing countries in the gathering of world water leaders and communities (Rahaman & Varis, 2005). At this time, also, extensive discussions of the main challenges to implementation took place and action programmes for participating countries were compiled based on the forum visions. The Global Water Partnership was formed as a result and is now the central coordinating organisation for this Framework for Action (Rahaman & Varis, 2005).

No attempt at defining IWM is apparent until the Global Water Partnership (GWP) published a report through its Technical Advisory Committee (TAC). This definition is the most cited today:

> IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. (GWP TAC, 2000 p. 22)

The GWP recognised that operationalisation of IWM has to be sensitive to the context of different situations since circumstances in different regions and countries vary greatly in terms of social, economic, institutional, cultural and natural conditions, to name but a few (GWP TAC, 2000). The GWP website and the scope and focus of its activities would indicate that GWP continues to be the organisation central to promoting IWM around the globe.

A review of previous water resource development principles at the International Conference on Freshwater in Bonn, 2001, made obvious the disparity between policy development and practice. This was answered by focussing on practical issues, which included identifying challenges and key targets and recommending action programmes for policy implementation (Rahaman & Varis, 2005; The Federal Government of Germany, 2001). IWM was recognised as an important part of achieving *The Bonn Keys*, which spell out five priorities for water management identified in the conference: water security for the poor, decentralisation, partnerships, cooperation and better governance (Rahaman & Varis, 2005; The Federal Government of Germany, 2001). The *Bonn Recommendations for Action* pertain to governance, financial resource mobilisation and capacity building as well as knowledge sharing (The Federal Government of Germany, 2001).

The conference was held in preparation for the World Summit for Sustainable Development in Johannesburg in 2002 and recommended that water issues should be harmonised with sustainable development and integrated with national poverty reduction strategies (Rahaman & Varis, 2005). Major achievements of the conference were the bringing together of developing and developed world views and addressing problems of implementation in an impartial manner. It was also the first time that action programmes were provided for achieving IWM in the field (Rahaman & Varis, 2005).

Also in preparation for the WSSD, the Stockholm International Water Institute issued four principles for recommended action: involvement of water users in water governance, urgent severing of the link of economic growth and water degradation, importance of urban water and sanitation services for stability and security, and application of integrated approaches to policy, planning and implementation (Falkenmark & the Symposium Scientific Programme Committee, 2005).

The adoption of the *Bonn Recommendations* at the WSSD resulted in IWM becoming the most accepted water policy tool worldwide (Rahaman & Varis, 2005). The WSSD identified water, energy, health, agriculture and biodiversity (WEHAB) as the key global issues. All of these are closely linked to IWM and the concept was identified in Agenda 21 (Thatte, 2005). The WSSD also provided targets and guidelines for implementation of IWM around the world, including the development of IWM and water efficiency plans for all major river basins by 2005 and the development and implementation of national and regional IWM strategies, plans and programmes (GWP, 2004; Rahaman & Varis, 2005; United Nations, 2002).

Towards the end of 2003, the GWP undertook an 'informal stakeholder baseline survey' reviewing the progress of countries around the world towards more integrated water resource management. The survey included 108 countries – 45 in Africa, 42 in the Asia/Pacific and 22 in Latin America (GWP, 2004).

> The survey provides a snapshot of where countries stand in terms of adapting and reforming their water management systems towards more sustainable water management practices. The preliminary results show that of the 108 countries surveyed to date, around 10% have made good progress towards more integrated approaches, 50% have taken some steps in this direction but need to increase their efforts, while the remaining 40% remain at the initial stages of the process. The survey provides a number of elements allowing an operational assessment of countries' readiness to meet the 2005 WSSD implementation plan target on IWRM Plan preparation. In this respect, the level of awareness, political support, the countries' capacity to build on past and on-going processes relating to water related reforms, to rely on existing multi-stakeholder platforms are assessed in the reports. (GWP, 2004, p. 3)

Preceding the Third World Water Forum in Kyoto (2003) the *Water Voice* initiative used the Internet and people-messengers in collaboration with international organisations and NGOs to facilitate the participation of over 21 000 people in recognition that forums are not sufficient in finding solutions for the world's water problems but that all people need to be involved (The Secretariat of the 3rd World

Water Forum, 2003c). There was also a *Virtual Water Forum* (VWF) held over 21 months leading up to the conference in which over 5 300 participants from 160 counties made contributions online (The Secretariat of the 3rd World Water Forum, 2003b). The idea behind the VWF was that "in order to protect our society and the planet, and to resolve the water issues for a future blessed with water, we need to change the way we live. Proposals to that end should be heard from everybody..." (The Secretariat of the 3rd World Water Forum, 2003b p.8).

In Kyoto itself, it was observed that IWM will probably be an integral part of all water initiatives, reinforcing the political recognition at the WSSD of IWM to achieve sustainable water management (Rahaman & Varis, 2005).

The First World Water Development Report then reaffirmed the commitment to an integrated approach to WM (UNESCO World Water Assessment Programme, 2003).

At the Fourth World Water Forum in Mexico (2006), for the first time a Local Government Declaration was signed beside the Ministerial Declaration (Secretariat of the 4th World Water Forum, 2006), recognising the importance of local governments in the management of water. The declaration reiterated many of the key principles espoused in previous conferences, covenants, conventions and declarations (Secretariat of the 4th World Water Forum, 2006). It also emphasised the importance of an integrated approach to WM.

The Ministerial Declaration also restated the commitment to IWM to achieve the goals agreed to in *Agenda 21*, the *UN Millennium Declaration* and the *Johannesburg Plan of Implementation* (JPOI = WSSD Plan of Implementation) (*4th World Water Forum Ministerial Declaration*, 2006). In addition, it reaffirmed the decisions on water made by the United Nations Commission on Sustainable Development in its 13th session (CSD-13) which acknowledge IWM as a framework for wise water management (Commission on Sustainable Development, 2005).

This short history shows that integration is recognised throughout the world with the intention that water policies and plans are based on these principles. However, judging from the multitude of publications on the subject, there seem to be some definitional issues as well as other difficulties, which are similar to those outlined for sustainability, which are preventing full implementation,. Before exploring further the barriers to the implementation of IWM, a look at the rationale behind integration, the

practice of IWM and its implementation may shed light on some of the difficulties that integration tries to overcome. It may also be useful in the highlighting of the extent to which integration addresses or is capable of addressing the full set of water values.

4.3 The Practice of Integration in Water Management

Support for an integrated approach to water management stems from the realisation that political economies have become too complex for traditional approaches (Jeffrey & Gearey, 2006). Complexities include that water management is often shared by a variety of agencies and that many problems related to water resources originate on the land or from economic and social activities (Mitchell, 1990). They also comprise technical, political and cultural as well as emotional and spiritual issues (Bowden, Fenemor & Deans, 2004). Emotions are important since they are connected to the interests that have to be weighed against each other (Geldof, 1995), which should encompass all the values of water (see Chapter 2).

Integration is seen as a means of cooperation and coordination to achieve improved and more effective outcomes (Mitchell, 1990) as well as satisfactory, though not necessarily optimal, solutions that are acceptable to all affected parties (Bowden et al., 2004). Wescoat and White (2003) consider watershed management, adaptive environmental management and global environmental management as especially promising examples of integration.

> IWRM aims to strike a balance between the use of resources for livelihoods and conservation of the resources to sustain their functions for future generations. The definition of IWRM promotes economic efficiency, environmental sustainability and societal equity – the three E's. (Falkenmark, 2003b, Preamble)

Hence, IWM is seen as instrumental in achieving sustainable use of water resources in Europe (ARC Seibersdorf Research, 2006) as well as in Australia (Syme & Nancarrow, 2002), South Africa (Pollard, 2001) and many other countries around the world (e.g. He & Chen, 2001; Shaxson, 2000; The European Commission, 2002). It "has been advocated as the most sustainable means to incorporate the multiple competing and conflicting uses of water resources" (Jeffrey & Gearey, 2006 p.1).

Integrated catchment management (ICM), the integrated management of water at a catchment scale, is seen as effective for managing both water resources and water quality in a river basin (UNESCO-HELP, 2004) thereby shifting attitudes from

competition and conflict to cooperation (Narnio, 2005). This is especially challenging in international river basins, e.g. the Mekong or Nile, but recent agreements have established management institutions defining powers and functions with the aim of synchronising riparian user actions, creating cohesive monitoring systems and information exchange while ensuring participant compliance (Molle, 2006a; Narnio, 2005; UNESCO-HELP, 2004).

> Integration implies a concern with upstream-downstream relations, including land use, coastal zone management, a unified management of surface- and groundwater, a shift to management at a catchment or river basin level, and harmonising water management with other sectoral policies with a collateral impact (trade, housing, energy, agriculture, etc). [Both] quantity and quality concerns need to be reviewed in conjunction. (GWP, n.d.-a p.5)

Syme and Nancarrow (2002) consider ICM as a potentially suitable framework for integrating sustainability concerns, and therefore social issues, in water resource management, because it:

> …strives for a holistic and integrated approach both to policies and processes. In principle, policies and strategies are developed through interactive, cooperative, and coordinated activities between government, its agencies, and the community. Institutional and governance issues are assumed to be part of the ICM process. (p. 455)

ICM takes social, political, economic and institutional factors into account as well as the natural, human and other resource uses in a watershed to achieve specific social objectives (He & Chen, 2001). It promotes sustainability based on biophysically meaningful units where "the environment provides the basic building blocks for social and economic analysis" (Syme & Nancarrow, 2002, p. 455). However, some authors argue that there is more integration of social than environmental considerations as shown by a growing commitment to inclusivity, transparency and shared governance (Wescoat & White, 2003).

The World Conservation Union (IUCN) proclaims integration based on the core values of equity, efficiency, sustainability, legitimacy, accountability, subsidiary and partnership to be the ultimate goal in resource management (Kakabadse, 2003). Others see integration as an evolving process, not a goal, with IWM providing a set of guiding principles for water management (Jeffrey & Gearey, 2006; Mohile, 2005) or IWM being a political process and an iterative method with the aim of sustainability (GWP, n.d.-a).

The GWP maintains that programmes and policies of other resource areas need to be analysed with regard to their influence on water resources since "… almost all national economic and social policies could have major impacts on water use" (GWP, n.d.-a, p. 1). Hence, integration may have sufficient breadth, at least theoretically, to accommodate all values of water. This is supported by the recognition of water being the common denominator linking land, water and ecosystems, with ICM providing an opportunity for integration (SIWI, 2002).

Though experience in some developed countries (e.g. US, France and the UK) has shown a single management unit to be most successful in achieving multiple use maximisation and economy while keeping up environmental quality and allowing for successful resolution of conflicts (see also 4.4.2.1), there is increasing evidence that implementation of IWM depends on 'polycentric rather than unicentric' democratic institutions and structures (Molle, 2006a). However, form, function and structure of these institutions may have to be adapted to local conditions – not 'one model fits all' situations – and may include very different components (e.g. pollution control, fisheries, flood protection, hydro-ecology, soil conservation and fee collection), as appropriate (UNESCO-HELP, 2004).

Much of the available information is in the form of case studies of particular catchments or management situations or describes the development and use of specific management tools. However, some publications summarise experiences at a more generic level; they do identify common issues but also differ considerably in their understanding of the prerequisites and practice of IWM.

This difference may be due in part to there being at least three alternative ways in which integrated water management can be approached. One looks at a system, its components and interrelations; another is broader in scope and acknowledges that a system interacts with other systems; and a third approach is akin to sustainability, relating the environmental, social and economic components to water (Mitchell, 1990). The IWM concept can also be applied to different levels of analysis. The normative focuses on what ought to be done, the strategic level asks what can be done and the operational level centres on what will be done. Although integration can occur on all levels, attention in water management will shift from level to level (Mitchell, 1990).

While "…consideration of land and water through an integrated approach offers the possibility of addressing the dynamics of an ecological system, thereby ensuring that

critical relationships are identified and managed" (Mitchell, 1990, p. 4), care is required to use the right approach at the appropriate level. At the strategic level a comprehensive approach is useful since it can identify and consider the broadest range of issues. At the operational level an integrated approach with a narrower focus on the most important parameters is practical, enabling meaningful on-ground management (Mitchell, 1990).

Table 4.1: Matching Water Management Approach to Level of Analysis (derived from Mitchell, 1990)

WM approach	Level of analysis
Single system, operational level	Narrow, practical focus
Interacting systems	Intermediate
Strategic level, total integration	Comprehensive

Over its 70 year history the concept of IWM has become a mainstream idea and is seen as essential for WM (Jeffrey & Gearey, 2006; Molle, 2006a), however, researchers in the Third World Centre for Water Management have argued that so far there has been no single case of successful[18] implementation (at least at the meso and macro levels) (Biswas & Tortajada, 2005; Thatte, 2005; Third World Centre for Water Management, 2002b). Criticism also has emerged from other parts of the world, such as Europe and Australia (e.g. Bellamy & Johnson, 2000; Jeffrey & Gearey, 2006; Medema & Jeffrey, 2007; Rhoades, 2000; Wescoat & White, 2003).

It has been recognised that despite much enthusiasm and the many commitments to IWM that have been made in three decades of conferences, these have been acted upon infrequently and much disparity remains between agreed policies and legislation and their implementation (Medema & Jeffrey, 2007; Rahaman & Varis, 2005; Rhoades, 2000; Varis, 2005). The best outcomes to date seem to be that integrated water management and integration occurs in 'bits and pieces' (Third World Centre for Water Management, 2002a), whereas in some cases the concept of integration may have been used to produce less than sustainable outcomes, e.g. in building multi-purpose dams in 'integrated river basin development' (Wescoat & White, 2003).

In India, for example, even though the IWM principles are recognised and applied, integration has been incomplete. All four *Dublin Principles of IWM* are only

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[18] The authors do not explicitly state what successful implementation is or how it is to be judged but see the aim of IWM to be making WM more sustainable or aid in the implementation of sustainable WM. Criteria are presumably based on the *Dublin Principles* but a lack of evaluation has also been criticised (see 4.4)

partially addressed in policy and implementation (Mohile, 2005) and WM has been plagued by "tardy implementation of well-meaning policies, leading to non-settlement of small grievances, which in turn leads to large-scale dissatisfaction" (Thatte, 2005 p.54). In contrast, some solutions that do not fit the IWM principles have been seen to work (Thatte, 2005).

Overall, IWM is conceptually attractive and easily promoted through policy but has proved to be almost utopian and constrained by implementation (Third World Centre for Water Management, 2002a). This lack of implementation is seen as its main problem and IWM could become just another rhetorical and idealistic 'buzzword' (as e.g. sustainability; see Chapter 3) if this hurdle cannot be overcome (Rahaman & Varis, 2005; Rhoades, 2000). The need for reform in governance, policy and institutions has been clearly recognised and it has been acknowledged that without addressing the existing shortcomings, integration is purely academic (Varis, 2005). Operationalisation of integration remains a significant challenge for communities, not only in developing countries (Bellamy & Johnson, 2000; Medema & Jeffrey, 2007), warranting a closer look at barriers to integration.

4.4 The Barriers to Integrated Water Management

The need to integrate the lessons learned from past IWM experiences has been highlighted (Rahaman & Varis, 2005) but so far there has been little evaluation and the success of existing integrated initiatives is not clear at present (Rhoades, 2000; Thatte, 2005; Wescoat & White, 2003), in terms of outcomes as well as with regard to processes, premises and institutional structures (Bellamy et al., 1999).

Knowledge about the shortcomings of integration does exist, as do suggestions about what needs to be done. Ideally, all relevant issues are dealt with together in integration, as the term implies, but since this is impossible in a linear document the following is a summary listing of a number of key issues which has to remain partial because conditions vary enormously with location (Rahaman & Varis, 2005).

As outlined earlier with regard to sustainability (section 3.2) the differentiation into separate issues is somewhat arbitrary since most of them overlap or are interconnected with each other. However, it appears that thematically the issues that are troubling integration are similar to those hindering implementation of sustainability and, hence, the same themes as in Chapter 3 are pursued here. This similarity also enables

later comparison of the barriers to implementation of sustainability and integration (section 4.6). Interconnections are highlighted by cross-referencing. First, the underlying barriers are explored followed by issues relating to structures and processes.

4.4.1 Underlying Perceptual Barriers

As with sustainability, there are some basic issues to be explored regarding the barriers to implementation of integration. Concept definition and underlying worldviews ultimately influence or determine implementation. Although definitional issues seem less pronounced in integration compared with sustainability, they are important as they identify the elements of the concept and their relationship to each other, providing fundamental guidance. Worldview and values also seem to receive less attention in the integration literature as compared to that of sustainability, but due to their encompassing nature, similar issues can be expected to be relevant.

4.4.1.1 Definitional issues

Although not strictly definitional, a name can reveal much about an idea with many different terms to choose from relating to integration. The older term 'integrated water resources development and management' (IWRDM) used especially in context with developing countries, has generally been replaced by 'integrated water resource management' (IWRM), raising some concern that developmental aspects may be neglected (Thatte, 2005). Other terms, such as 'integrated river basin management' (IRBM), 'integrated water management' (IWM), 'integrated resource management' (IRM) and 'community-oriented watershed management' (CWSM), all refer to the management of both surface and groundwater resources on a basin-wide scale through basin-level institutions (Thatte, 2005). This also applies to 'integrated catchment (or watershed) management' (ICM/IWM) although the terms may vary with regard to scale or context. Sometimes 'integrated planning' and 'integrated assessment' refer to part of the process.

There is confusion resulting from this multiplicity of terms as to what parts of the water cycle and which water resources are included in management, and in the case of CWSM it may be less obvious that an integrated approach is implied. It seems illogical that integration, which is supposedly inclusive, would distinguish between different elements of the water cycle, limiting the potential for integration.

Arguably, in order to implement integration and to reach its goals, it is important to define the concept of integrated management and what conditions are needed to achieve it (Mitchell, 1990). Biswas (2005) argues that the concept, at least as defined by the GWP (see section 4.2 for definition) is not implementable in practical terms. According to him it is vague and uses many terms that can be interpreted in many different ways; 'promotes', 'related resources', 'maximise', 'economic and social welfare', 'equitable', 'sustainability' and 'vital ecosystems' all fall into this category. The definition is also seen as internally inconsistent and not able to provide any real guidance to water practitioners on how to improve water management (Biswas, 2005). These issues are important since only if a definition can be translated into measurable criteria can there be meaningful evaluation of specific cases of application (Biswas, 2005).

Focus on the origin (etymology) of the words 'to integrate' and 'integration' reveals that they have a Latin root – *integratus* – which is the past participle of *integrare*, to make whole, to heal, to refresh; to renew, to begin afresh. *Integratio* means renewing. Other sources use the root *integer* which means whole, untouched, unhurt, undamaged or complete, entire.

A dictionary may be a more appropriate tool to discover the meaning of a word but probably should be used only as a guide since meanings can change relatively quickly and would depend on the context (Aitken, 2006; Laird, 1970) [19]. In this case, the origins are reflected in today's meaning of the word; the English verb 'to integrate' means: to form into one whole; to make entire; to make into a whole by bringing all parts together; to unify; to complete. It can also mean to indicate the whole of or to give the sum or total of. Other meanings are: to join with something else; to unite; or to make part of a larger unit, but also to renew, to restore or to perfect. Correspondingly, the English noun 'integration' means the act or process of making entire or whole. 'Integration' is used in many different contexts but here the focus is on those relevant to NRM/WM. In a general sense, integration implies a bringing together of things, a process of combining or accumulating, as well as renewal and restoration.

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[19] Exploring the meaning and origin of integration is intended to provide some context and may help in understanding the concept of integration and its intentions. Although etymology has been suggested as a useful tool in teaching and understanding the meaning of words (Laird, 1970) it seems this has been rejected in modern linguistics which uses etymology to discover the origins of words and track their change in meaning over time. The actual meaning of words is given by the current context which can vary considerably between cultures and persons (Aitken, 2006).

Used in the sense of making whole, 'to integrate' implies that something is fragmented, broken or not in the complete state it should or could be in. This seems fitting since in Western society our relationship with water and its management does appear to be less than whole and complete and in need of 'healing' or 'perfecting'. So, the word used in conjunction with 'water' could imply that our relationship with water is broken and needs fixing. The water cycle itself is still functional but may be impacted and influenced by human actions, while approaches to water planning and management are fragmented into many different sectors and institutions that all have a relationship with only parts of the water cycle, making this relationship incomplete. The Western view of water as a commodity and private good could also be included since it indicates a limited relationship with a life-giving substance that may require healing (making whole).

Those meanings of renewing, restoring and perfecting put an illuminating slant on integration since these aspects are adaptive, acknowledging change and the need for action to accommodate it, albeit in a way that builds on the original or even restores the original conditions. While this meaning seems to be neglected in resource management it could add a valuable dimension in light of perpetual change, making the adaptive element automatically part of integrated management. Looking at the meaning of words can open up new aspects of a concept that could enhance it.

Besides definitional and meaning issues, overall, the goals of ICM are unclear and often contentious, while on a more functional level there has been little practical guidance on the implementation of integrated systems-based management (Bellamy & Johnson, 2000) and "few guidelines or case studies are available to help make participatory watershed projects relevant to local populations" (Rhoades, 2000, p. 335).

Jeffrey and Gearey (2006 p.3) summarise:

> Despite its popularity (and one might say its reputation) IWRM remains: (i) a theory about, (ii) an argument for, and (iii) at best a set of principles for, a certain approach to water resources management. Empirical evidence which unambiguously demonstrates the benefits of IWRM is either missing or very poorly reported. Hence, there is no recipe book, no laws, no formulae, no blueprint. Little wonder then that the migration of IWRM from theory into practice has been sluggish.

The issues raised in this section regarding the variety of terms used in integration, the critique of the definition, the limited use of the different meanings and, particularly, the lack of practical guidance, all indicate that there are underlying issues that require attention if integration is to be successful.

4.4.1.2 Dominant Western Worldview

One of the barriers to the implementation for IWM is the existing infrastructure and technology focus (Third World Centre for Water Management, 2002a), which can be seen as an expression of the belief contained within the predominant industrial worldview, that eventually technological development will provide solutions for all of society's problems (Olsen, Lodwick & Dunlap, 1992). While technical issues are important, policies and institutional and human resource issues are imperative to achieving integration (Molle, 2006a; Third World Centre for Water Management, 2002a) but so far, predominantly technical solutions have neglected public and private costs and benefits as well as social impacts (Bellamy et al., 1999; Jeffrey & Gearey, 2006).

This is of particular concern since the driving forces of water demand, the barriers to 'achieving from knowing to doing', and the incentives and other influences that drive stakeholder behaviour have strong social components (Falkenmark & the Symposium Scientific Programme Committee, 2005). Uncontrolled population growth and density are huge problems (Rast & Holland, 2003) particularly in Asia, but they receive insufficient attention and are usually considered externalities beyond the scope of water policies (Varis, 2005). However, there are clear connections between water and population relating to water availability, pollution and many human development aspects. For example, education, gender equity and poverty reduction are positive influences on both water development and population control (Varis, 2005), while health and wellbeing are linked to integrated water development and management, as is water use for agriculture and food security, which in turn is related to poverty (Varis, 2005).

Safe water supply and sanitation are the key to socio-economic development and quality of life, with sustainable sanitation technology readily available but unfortunately not yet widespread (Falkenmark & the Symposium Scientific Programme Committee, 2005). This highlights another element of the predominant worldview, that of economic rationalism; 'user pays' and 'full cost recovery' limit the distribution of technology to

those who can pay for it. The related attitudes of government decision-makers seeing water as property often hinders implementation of integrated approaches (Mohile, 2005) and the associated market approach to water neglects socio-cultural, political and environmental aspects (Brohman, 1995; McCarthy & Prudham, 2004).

It becomes obvious that many of the issues mentioned here are related to the values of water, with one of the most worrying aspects of Western style WM being the simplistic representation of water issues. This requires a change in recognition of the fundamental importance of water (Falkenmark & the Symposium Scientific Programme Committee, 2005). Many of the water values outlined earlier are currently neglected or not acknowledged in IWM, including spiritual and cultural aspects. By extension, integrated water management should involve the whole person, physical, mental, emotional and spiritual aspects, since water has a connection with all.

> Water is the common symbol of humanity, social equity, and justice. It is one of our compelling links with the sacred, with nature, and with our cultural heritage (Dooge, 2003). A case in point is the Ganges River in South Asia, which has a very strong spiritual and cultural significance for all Indians, Bangladeshis, and Nepalese (Rahaman & Varis, 2005 p.20).

In addition, restoration of highly modified rivers and floodplains and associated ecology needs more attention since the proper function of these systems is a prerequisite for sustainable water resources but has been neglected and/or less than successful in parts of the world (e.g. Brooks & Lake, 2007; Palmer, Allan, Meyer & Bernhardt, 2007; Rahaman & Varis, 2005). Fisheries are also usually severely undervalued despite their importance for human wellbeing and survival as well as ecosystem function (e.g. Clausen & York, ; Smith, Nguyen Khoa & Lorenzen, 2005). Aquaculture, which is the fastest growing form of protein production on the planet, requires consideration because of its effects on the water system and other ecosystems (Asche & Khatun, 2006; Moffitt, 2005; Rahaman & Varis, 2005; Tidwell & Allan, 2001).

As long as many of the values of water are neglected, integration cannot live up to its name and is in real danger of becoming another rhetorical 'buzzword' resulting in the diminishment of its relevance and acceptance. The underlying difficulties described here have follow-on effects that can be seen in the resultant institutional and structural barriers that affect implementation of integration.

4.4.2 Resultant Institutional, Structural and Procedural Barriers

The institutional, structural and procedural barriers that follow on from the underlying causes that hinder full implementation of integration have been divided into four themes that are particularly relevant for implementation: leadership, political processes and structures; integration and adaptability; information, knowledge, capacity, education, complexity and communication; and economics and finance (for a rationale see 3.2 and 3.2.2). They are examined in turn below.

4.4.2.1 Leadership, Political Processes and Structures

In addition to those authors who have identified and outlined barriers to implementation of integration, many more have recommended and suggested improvements to the current situation, which strongly implies that those aspects have not yet been dealt with satisfactorily. Accordingly, the problems with implementation of integration can mainly be ascribed to inappropriate legal and institutional arrangements or frameworks, including decision-making, at all government levels rather than to a lack of policies (Falkenmark & the Symposium Scientific Programme Committee, 2005; Mohile, 2005; Third World Centre for Water Management, 2002a). The usual rational and centralised planning and management is not suitable for integrated management which needs a new opportunistic and adaptive approach (Bellamy & Johnson, 2000; Jeffrey & Gearey, 2006) while a lack of information access can preclude transparent and democratic governance systems in some areas (Varis, 2005) (see 4.4.2.3).

Legitimisation of integration should improve the likelihood of implementation but is still insufficient in many countries. A statutory basis would provide the strongest support, especially when backed by strong political will, whereas administrative or bureaucratic directives alone are easily undermined (Medema & Jeffrey, 2007; Mitchell, 1990). Such an enabling environment, or 'rules of the game' consisting of national, regional and local polices and legislation (Thatte, 2005), would have to be sound, 'do-able' and realistic and should address key challenges while being accompanied by enforcement (Falkenmark & the Symposium Scientific Programme Committee, 2005). In many cases, legislation reform may be required to reduce overlaps (UNESCO World Water Assessment Programme, 2003; Varis, 2005) and to ensure that jurisdictional gaps are filled (UNESCO World Water Assessment Programme, 2003).

The development of governance and appropriate institutional roles is crucial to ensure that responsibilities are assigned clearly. Some proponents argue that water

management and supply can be improved through the separation of the policy, regulatory and service divisions (Falkenmark & the Symposium Scientific Programme Committee, 2005; UNESCO World Water Assessment Programme, 2003), which raises questions about the 'integratedness' of such an approach, while others maintain that it is best provided by a single resource management agency with clear direction imparted by legislation and plan(s) (Bowden et al., 2004; UNESCO-HELP, 2004). IWM may not depend on, or even be hindered by, the existence of a single catchment organisation, and various arrangements are possible, but all need to be amenable to multi-stakeholder dialogue and allow for differences between countries (Falkenmark & the Symposium Scientific Programme Committee, 2005; Jeffrey & Gearey, 2006).

It seems essential to avoid duplication of management structures, and often there may be more success in utilising existing systems and strengthening those before creating new ones, which should be done only if absolutely necessary (Rhoades, 2000). It is likely that the most suitable arrangement will vary with the situation and between national and regional levels, while different organisational structures may be appropriate for different scales, taking various forms on a sliding scale from large to small (Mitchell, 1990). However, there will never be "a perfect match between function and form" (p.12) and boundary problems will always emerge (Mitchell, 1990).

Complex legal and institutional arrangements can lead to agencies shirking responsibilities and a lack of accountability (Bowden et al., 2004), which are reasons why new configurations should be as simple as possible, involve local people with legitimate interests, be able to facilitate communication between the different parties and able to mediate in cases of conflict (Rhoades, 2000). Arrangements should also encourage stakeholder participation at all levels and between levels (UNESCO World Water Assessment Programme, 2003) (see later this section) and an adaptive approach seems appropriate in light of the ever-changing conditions of the water system (Jeffrey & Gearey, 2006) in which "a single, one-time determination of the best solution will not suffice" (Geldof, 1995, p. 306) (see section 4.4.2.3). Hence, accountability and flexibility are important for organisational structure(s) (Mitchell, 1990) while ensuring adequate coordination mechanisms and matching responsibilities to authorities and their capacity for action (UNESCO World Water Assessment Programme, 2003).

Currently, a shift from 'top-down' to 'bottom-up' approaches is occurring in WM, with governance and institutions needing to reform and adjust to this (Varis,

2005). Reduction of government control of resources has been recommended, especially at the micro level[20] (Thatte, 2005), but decentralisation and governance are still problematic (Third World Centre for Water Management, 2002a; Varis, 2005). Private-public partnerships may be valuable in some situations (e.g. urban water management), since public or private approaches alone may be inadequate (Falkenmark & the Symposium Scientific Programme Committee, 2005), but these are problematic in cases of serious governance system malfunction (Varis, 2005).

The informal sector[21] with its informal institutions has been largely neglected in WM to the present, particularly in the developing countries, although it has an important role in setting the rules for society with the majority of people belonging to it (Varis, 2005). It provides legislative, judicial and administrative functions as well as informal roles of culture, religion and ethnicity (Varis, 2005). Many policies that promote public awareness, participation and "grassroots" activities target this sector at least partially and it is increasingly recognised by development programmes but still neglected in the water arena (Thatte, 2005). In many countries the informal sector is increasing and growing in importance compared to the increasingly ineffective formal sector (Thatte, 2005). This warrants more respect and integration into water management, while at the same time there are many challenges since this sector is deeply interwoven with traditions and culture and often also riddled with corruption, bribery and local 'mafias' which need to be brought under control (Varis, 2005). These issues of 'formalising' informal elements may require more attention when integration is the aim.

A central key to IWM, not always realised, is the combination of empowerment, public awareness and participation, because only active, aware and empowered people can contribute to overcoming hopeless resource situations, both natural and financial (Varis, 2005). Community participation is crucial for successful management and critical in reducing conflicts, reaching compromises and making the outcomes of WM projects socially acceptable (Chenoweth, Ewing & Bird, 2002; Koontz & Moore Johnson, 2004), but has sometimes received insufficient attention at least in parts of the world (Third World Centre for Water Management, 2002a),. Three aspects require consideration: the actors (who are able to influence outcomes), the agenda (including

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[20] The micro level supposedly refers to the local level, but this is not defined by Thatte (2005).

[21] The informal sector is that part of society that is not represented through either the public sector (i.e. government or public utilities) or the private sector (i.e. business, industry and commerce) and includes non-government organisations and spiritual and cultural institutions with their legal, jurisdictional and administrative functions.

priorities and value orientation) and the arena (the actual place where the meeting between stakeholders can occur) (Falkenmark & the Symposium Scientific Programme Committee, 2005).

All relevant stakeholders, including those with decision-making powers, need to be involved in order to increase or even enable the acceptance of outcomes (Bowden et al., 2004; Hanna, 1999; Mitchell, 1990). The identification of stakeholders may be difficult due to great diversity and complex interactions amongst them (Bowden et al., 2004; Falkenmark & the Symposium Scientific Programme Committee, 2005). This includes primary stakeholders, such as user groups, polluters, government authorities and NGOs, as well as those whose welfare is influenced and may be seriously affected by the decisions that are reached. Other, less prominent, stakeholders should also be involved in the decision-making process, aiming for as broad as possible involvement of the usual established and industry stakeholders and other interested parties (Coakes, 1999; Falkenmark & the Symposium Scientific Programme Committee, 2005; Konisky & Beierle, 2001; Koontz & Moore Johnson, 2004).

An internal report on watershed management in Asia found that "*only* in situations where the project builds on the cosmology and indigenous institutions of the people will the project be long-term and sustainable" (Rhoades, 2000 p. 335, original emphasis). The involvement of local people but also a broad spectrum of interested parties external to the area (scientists, governments, NGOs, etc.) in project design, execution and problem identification is crucial for outcomes that 'save nature' while improving people's livelihoods. Including non-local participants, although often crucial, can be quite costly because many of these people, such as scientists, government officials and NGO members, have to be paid for their participation (Rhoades, 2000).

Replacement of the previously dominant technology and engineering approach to water with emphasis on infrastructure development by one of re-feminisation is increasingly accepted. This means that women need to be consulted on their specific water needs, including those as custodians for other users, and be included in both policy and decision-making (Falkenmark & the Symposium Scientific Programme Committee, 2005). Although it is recognised that women could contribute enormously to water management by changing attitudes towards water and associated decision-making in the direction of caring and sharing rather than resorting to fighting (Falkenmark & the Symposium Scientific Programme Committee, 2005; Westermann,

Ashby & Pretty, 2005), participation of women is low (Ghosh, 2007; House, 2005; Varis, 2005).

In some cases, certain groups may not want to participate but it may be critical for successful outcomes to involve them (Bowden et al., 2004). The danger must also be avoided of those participants, who feel that their influence is limited, suffering from 'burnout' (Falkenmark & the Symposium Scientific Programme Committee, 2005). Stakeholder support is paramount but may be problematic if proposed actions are perceived to have negative effects (Third World Centre for Water Management, 2002a).

Stakeholder participation processes must have rules that assure legitimacy of views as well as legal recognition (Falkenmark & the Symposium Scientific Programme Committee, 2005). It should be clear from the outset that representatives need to have a mandate for committing groups to the decisions that are reached. Mutual respect and willingness to discuss differing views are essential (Bowden et al., 2004) both within and between groups. Caution is also required with regard to participation methods. Some of the newer methods, such as "rapid rural appraisal" and similar, can lead to superficiality and can become condescending and patronising instead of treating people as colleagues and with respect (Rhoades, 2000). Another difficulty may arise from the participatory nature of such projects as to agreement upon assumptions, methodologies, goals and operating procedures especially with inadequate guidance (Rhoades, 2000). Pitfalls in implementation also include high expectations being raised by participatory multipurpose watershed projects which can be easily disappointed because of the different agendas and conflicting interests that all parties bring with them (Rhoades, 2000).

It is important in implementation to maintain good structure to ensure that all participants can be heard (Rhoades, 2000). Professionals should be available to provide expertise on water issues and assist with problem analysis but need to keep explanations easy to understand (Falkenmark & the Symposium Scientific Programme Committee, 2005). Personal relationship building can aid in creating confidence and trust in the process, while time and financial costs can be major barriers for participation. Incentives and agency support may be necessary (Bowden et al., 2004). Rhoades (2000) also highlights the importance of organisational issues where funding agencies and others may want more efficiency and clarity that may only be achieved at the expense of broad local participation, which is not desirable.

Since decisions in water resource management are often based on negotiation, the context or setting of the management area or issue is important. It varies with factors such as the conditions and state of the natural environment, the prevailing ideologies (see also 4.4.1.2) and economic conditions (see 4.4.2.4) as well as existing legal, administrative and financial arrangements (Mitchell, 1990), influencing governance and institutional roles as well (UNESCO World Water Assessment Programme, 2003).

Catchments are arguably the natural framework for water management as they comprise both aquatic and related terrestrial ecosystems which makes it critical that mechanisms for land use, water planning and management are focussed on the river basin scale (He & Chen, 2001; Narnio, 2005). Although hydrological units could be useful management units they seldom coincide with regions, which are the administrative equivalent (Molle, 2006a; Thatte, 2005; Third World Centre for Water Management, 2002a). Watersheds often not only cut across major administrative boundaries complicating integration (He & Chen, 2001) but also other socio-cultural boundaries that exist across watersheds (e.g. ethnic, religious, municipal, individual holdings) (Rhoades, 2000) or ecological bioregions (Molle, 2006a). There are also limits to integration due to well-established national sovereignty principles and legislative differences (Medema & Jeffrey, 2007), while the basin concept may be too restrictive and no longer realistic for inter-basin transfer of water but combining multiple basins becomes too large for politically and institutionally effective management (Mohile, 2005).

The suggestion to utilise existing socio-ecological boundaries based on sense of place and sphere of influence (Brunckhorst, Coop & Reeve, 2006) rather than those based on catchment boundaries alone would require primary attention to be given to "the institutional landscape and human decision-making since these constitute the causal factors underlying land or water degradation" (Rhoades, 2000, pp. 331-332). While the discussion is ongoing and unlikely to be resolved in the near future, the most appropriate and feasible approach may have to be chosen depending on local conditions (Molle, 2006b).

Appropriate structures, such as new participatory groups or simply good organisational or facilitation skills may be required to enable communication between parties (Bowden et al., 2004). New models of mutual upstream/downstream solidarity and shared water resource protocols that have confidence-building as an essential

element are promising (Falkenmark & the Symposium Scientific Programme Committee, 2005). "In addition, such [partnership] projects are expected to advise, catalyse, and network with policy makers to inform and perhaps change their decision-making" (Rhoades, 2000, p. 333).

There are clear differences in self-interest among stakeholders and an important aspect is how much individuals can 'internalise' the interests of others (Falkenmark & the Symposium Scientific Programme Committee, 2005). Care should be taken that participation does not turn into a 'power game' of self-interested stakeholders and that stakeholders realise the value of surrendering single sector objectives and vested interests (Falkenmark & the Symposium Scientific Programme Committee, 2005). In cases of strong distrust, efforts towards catchment-based planning may be severely undermined as is the case when vested interests are involved (Falkenmark & the Symposium Scientific Programme Committee, 2005). In such situations, although problems may be well known and solutions provided, progress will be minimal (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Organisational culture and participant attitudes are the ultimate determinant of successful integration, cooperation and coordination. This includes political will. But so far, a general lack of political will has meant that water is not a priority issue on the political agenda (Rast & Holland, 2003; Third World Centre for Water Management, 2002a). It is not only politicians who can take the initiative, but those respected members of the community who lead by example can be invaluable in facilitating shared solutions since they can function as catalysts, alleviating the need to convince everyone of a required change (Bowden et al., 2004). However, vision and leadership are essential from at least one, but preferably all, parties to reach solutions, including negotiated compromise in WM (Bowden et al., 2004). Unfortunately, in many cases, a whole-of-government approach and real government commitment or involvement are missing, resulting in a lack of adequate resources, financial and otherwise (see section 4.4.2.4), as well as inadequate strategic implementation mechanisms and arrangements (Bellamy & Johnson, 2000). In fact, a lack of government commitment and vision will probably result in structures and processes that are, overall, inappropriate for integration.

4.4.2.2 Integration and Adaptability

The clear connection and interdependence of water with terrestrial and aquatic ecosystems, as well as their related uses with impacts on water resources, have been recognised (e.g. World Water Council, 2000b) as requiring integration at multiple levels and between different sectors, e.g. water, energy, finance, transport, social security, etc. This includes a variety of stakeholders and governments that should be considered all together; for example, different water uses, upstream and downstream interests, gender related concerns, interests of ethnic minorities and socially disadvantaged groups as well as those who benefit and those who are detrimentally affected (Mohile, 2005). However, politicians often do not understand the mutual dependence among catchment stakeholders (Falkenmark & the Symposium Scientific Programme Committee, 2005) which then results in a lack of appropriate community involvement (see 4.4.2.1).

In addition, there are different phases of the hydrological cycle (Mohile, 2005) as well as technical issues that need to be considered (Thatte, 2005). An integrated approach includes legislation, policy, strategy development, institutional and capacity building, human resource development and management, advocacy and dissemination, and more. It is important that this human dimension is considered equally with all other aspects (Mitchell, 1990).

Biswas (2005) has compiled a list of 37 issue combinations from the literature that all vary but also overlap, ranging from bio-physical and social concerns over administrative and economic considerations to a variety of sectors, timing and policy, to name only a few. This variety makes clear how complicated and intertwined the integrated approach can be, while showing simultaneously that integration initiatives are generally limited to a small set of issues rather than being fully integrative on a broad scale. Closer inspection of the level aimed at in the projects examined by Biswas (see table 4.1), is likely to reveal whether some of the variety and limitations stem from an operational, more localised and narrower focus, which could explain their limitations.

Probably the most worrying aspects in water management and administration are fragmentation and a simplistic approach, which has led to the neglect of the societal impacts on water and associated misuse and environmental degradation (Falkenmark & the Symposium Scientific Programme Committee, 2005). Often, unsustainable water use and lack of integration can be linked to the separation of responsibilities regarding water use and allocation between different authorities (Rast & Holland, 2003),

uncoordinated management within and between government sectors (Mohile, 2005; Third World Centre for Water Management, 2002a; Varis, 2005) and missing structure regarding water in non-governmental institutions (Mohile, 2005). This also applies to other sectors, such as energy (Third World Centre for Water Management, 2002a).

Nevertheless, in contrast to environmental integration, social integration seems to be progressing faster, as shown by an increasing commitment to "inclusivity, transparency and shared governance" (Wescoat & White, 2003 p.247), which in turn is a prerequisite to progress both social and environmental considerations (a promising example could be the Dialogue on Water, Food and Environment convened by IWMI) (Wescoat & White, 2003 p.247).

As is obvious from the multitude of aspects that need to be considered in integration, coordination and cooperation become central (He & Chen, 2001) and some of the biggest challenges are to avoid (or overcome) compartmentalisation and to break intellectual and institutional barriers (e.g. Flinders, 2002). However, collaboration so far is generally limited and often *ad-hoc* (Thatte, 2005) and there have been difficulties in inter-sectoral cooperation (Bellamy & Johnson, 2000; Bellamy et al., 1999). Implementation is highly complex and requires effort and initiative from involved parties that often have different interests and therefore may be reluctant to cooperate (Third World Centre for Water Management, 2002a). There is also a lack of understanding and testing of undertaking teamwork in such multi-objective and multi-institutional settings that are highly political and involve institutions that have not worked together before (Rhoades, 2000).

Water is the physical link between different water sectors and upstream and downstream users, and conflict is to be expected and normal, requiring water managers to realise that they operate in a complex political and economic situation (Falkenmark & the Symposium Scientific Programme Committee, 2005; Jeffrey & Gearey, 2006). Transboundary river basin management is a particularly complex situation that has many challenges for which satisfactory solutions generally have not been found. Problems include those for 'normal' watersheds outlined earlier but are also exacerbated by economic and military imbalances between parties as well as a lack of formal agreements on water allocation, dispute resolution mechanisms and practical implementation frameworks (Rahaman & Varis, 2005). Even in cases where formal

agreements exist, legal and administrative differences can make operationalisation difficult (Medema & Jeffrey, 2007).

In WM long-term planning is necessary (Thatte, 2005) and strategic planning is essential to prevent crises, to anticipate change and to allow for the collection of environmental information which takes years (see also 4.4.2.3). Insufficient information may require revisiting decisions within a short time-frame to allow for adjustment on a regular basis to new findings (Bowden et al., 2004). Reassessing decisions is also prudent because degradation and damage are generally more costly to remedy than to prevent (Bowden et al., 2004). Catchment plans are an important mechanism to bring about cross-sectoral interaction to achieve comprehensive coverage of issues and bring different types of knowledge, e.g. scientific and local (Mitchell, 2005), while external events such as droughts may help in promoting intersectoral consent (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Management functions should be distributed appropriately according to scale or level (local, state, federal) (see also 4.4.2.1) and can be divided into categories (generic and substantive). Different situations may require a different mix of scales; generic as well as substantive functions, and flexibility. Adjustment over time may be necessary (Falkenmark & the Symposium Scientific Programme Committee, 2005; Mitchell, 1990), but most water administration structures are not able to handle the complexities of water issues because they are too inflexible and sectorised and have insufficient staff (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Distrust of the process can be a major hurdle on the way to integration (Medema & Jeffrey, 2007) as can be the propensity of scientists and bureaucrats to entertain a partial view of reality (Falkenmark & the Symposium Scientific Programme Committee, 2005). This may be derived from the worldview they entertain (see 4.3.1.2) but may also be connected to a lack of knowledge, awareness and capacity as well as a lack of communication.

4.4.2.3 Information, Knowledge, Complexity, Capacity, Education & Communication

An overall lack of data and information exchange, information dissemination, awareness and education has been identified in WM (Third World Centre for Water Management, 2002a). Inadequate knowledge and understanding of long-term effects of (agricultural) activities on the environment led to continued unsustainable or inequitable

practices (Bellamy & Johnson, 2000). Complexity of water, environmental and human systems makes "integration difficult if not elusive" (Wescoat & White, 2003 p.239) and is a central factor in paralysing inflexible administrative systems (Falkenmark & the Symposium Scientific Programme Committee, 2005) (see also 4.4.2.1). Scientists also have problems with the practicalities of dealing with the highly complex human-land-water-waste system in its entirety including the physical and socio-economic dimensions (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Overall, there are difficulties in identifying and addressing interrelated social, technical, institutional, legal, economic and political factors (Rast & Holland, 2003) (see 4.4.2.2). The breadth of these challenging aspects means that a variety of mechanisms and arrangements is needed to address them, with many of the solutions being spatially variable (i.e. either location, position in landscape, or enterprise specific) (Bellamy & Johnson, 2000).

Availability of good information is a prerequisite for integration but it has to be used effectively. Information should be adequate and based on science to allow for informed debate and solution finding (Bowden et al., 2004). This also includes technical as well as social information. In fact: "intensive social science research is *absolutely* necessary to make it clear that hidden agenda, internal conflicts, power struggles, shifting alliances, resources and territorial struggles within communities must be understood and accounted for in the project implementation" (Rhoades, 2000 p. 338 original emphasis).

Partnerships are not only needed with regard to management but interdisciplinary collaboration in the sciences is also necessary (Falkenmark & the Symposium Scientific Programme Committee, 2005). This does not preclude the importance of local knowledge, which, once validated, can be especially valuable in providing long-term information and cultural insights. It also helps in increasing community acceptance of process and outcomes (Bowden et al., 2004).

Science is undoubtedly important for integration since sound scientific knowledge is required for good decision-making. However, in finding solutions for water problems, not only engineering and environmental science knowledge is needed, but social and political sciences are also instrumental, making an interdisciplinary approach imperative (Falkenmark & the Symposium Scientific Programme Committee, 2005). This is problematic in cases where social scientists are marginalised or pushed

out of projects (Rhoades, 2000) leading to the neglect of an important part of the equation (Chapter 2).

That scientific experts may not always agree on the technical details or are found to be wrong is an accepted part of 'doing' science by scientists but can be disconcerting to stakeholders who then may doubt the validity of any claims or findings (Bowden et al., 2004). In other cases, research-only projects have neglected to translate findings into practice, disappointing participants and researchers (Rhoades, 2000).

Practical management instruments are needed to assist water managers and there are many of those available for use in integration. The art lies in the selection, adjustment and application of an appropriate combination of tools in a given situation (Mitchell, 1990; UNESCO World Water Assessment Programme, 2003). Incomplete or non-integrated application of available tools and techniques should be avoided (Rast & Holland, 2003). Since IWM poses some unprecedented challenges, existing instruments may not always be suitable or adequate. Encouragingly, there have been new initiatives in a push to assist in tool selection, e.g. the GWP ToolBox (GWP, n.d.-b), and to help with integration of science with management, e.g. the UNESCO/WMO HELP programme (UNESCO/WMO-HELP, 2004).

IWM projects need to operate on, and integrate, many different spatial scales, including those that are human organisational as well as physical (Rhoades, 2000). Issues should be defined properly and it may be necessary to deal with smaller sub-issues or constrain the scope for tractability while keeping the context in mind (Bowden et al., 2004). Site-specific climate, economy, environment, culture and social conditions need to be considered (Falkenmark & the Symposium Scientific Programme Committee, 2005).

Timeframes of long-term environmental change and short-term economic and political agenda are difficult to reconcile (Bellamy & Johnson, 2000) and long-term considerations are often not considered practical (Falkenmark & the Symposium Scientific Programme Committee, 2005) or are neglected (Rhoades, 2000).

Limited attention has been given to local issues, and policies have often neglected these (Third World Centre for Water Management, 2002a). This has been shown in the less-successful-than-expected technology transfer and conveyance of experiences and management practices from developed to developing countries

(Falkenmark & the Symposium Scientific Programme Committee, 2005). Since implementation problems and solutions vary according to region, highly prescriptive or universal policies and guidelines for IWM may be counterproductive (Rahaman & Varis, 2005). Conversely, insufficient incentives to adopt sustainable practices and a lack of recognition of the integral role of local government have limited local effectiveness (Bellamy & Johnson, 2000).

Public education may be an effective way to achieve long-term changes in behaviour at the community level. Media and education campaigns that run for a long time and are produced in conjunction with government, water management agencies and utilities (Narnio, 2005) may be of use, although a much broader approach to education involving the whole of the educational system and all other areas of life, at home, at work and at leisure, seems more effectual (Smyth, 2006). Among the many hurdles that can hamper public education, as well as more pedagogical issues, are unwritten rules in the media, with stories having to be short, interesting and locally relevant (Falkenmark & the Symposium Scientific Programme Committee, 2005).

The general understanding of water issues based on the simplistic representations that are prevalent among the public, and also among politicians and policy makers, would gain from being replaced with the recognition of the fundamental importance of water in a systems context. However, this is a major pedagogical task requiring water experts to provide messages that are easy to understand without losing complexity (Smyth, 2006). More emphasis should also be placed on women as the 'first educators', indigenous knowledge, values and the overall variability of the environment and its people (Smyth, 2006).

Good communication that is effective because it is relevant to those it is aimed at (Schiller, Hunsaker, Kane et al., 2001), requires effort and commitment, but is essential in ICM with broad stakeholder participation (Dent, 2000). It should occur on different levels, both informally and formally (Narnio, 2005), and can assist in creating trust, faith and compromise while necessitating negotiation on an ongoing basis (Dent, 2000). Information dissemination may be aided by electronic means such as GIS, databases and websites, requiring good information management and data quality (Bowden et al., 2004).

The quality of the negotiations will depend largely on the quality of the information and the levels of understanding of the issues which all parties have.

In the absence of the type of information which leads to understanding, the process is likely to be riven with dissent and acrimony. It is imperative that the process of arriving at the information which is being disseminated is characterised by consensus, since any information which is not trusted will jeopardise the process. (Dent, 2000, p. 515)

It is also important that the next generation of professionals is able to handle ever-increasing complexities (Ripl, 2003), requiring appropriate training of resource management personnel. Overall, capacity building has been insufficient (Third World Centre for Water Management, 2002a) and training should include negotiating, bargaining and compromising skills (Mitchell, 1990). The predominance of natural sciences and engineering in the water field at present may have led to the neglect of capacity building with regard to governance and human dimensions research thus resulting in a lack of researchers in these fields. It is essential that partnerships are developed between these areas, producing models of interdisciplinary research (Pahl-Wostl, 2006b).

Clearly, many of the issues mentioned in this and the previous sections require adequate financial resources, but other economic issues may also be important.

4.4.3 Economic and Financial Issues

Integrated approaches often have high costs (Mohile, 2005) and due to the breadth of ICM projects, it is difficult to keep transaction costs manageable (Bowden et al., 2004). An added challenge in poor countries, which is the provision of adequate funds, should not be a problem in richer nations. However, there has been a general lack of funding (Bellamy & Johnson, 2000; Bellamy et al., 1999) as well as insufficient provision of resources (Third World Centre for Water Management, 2002a) for integrated projects.

While earlier investments in water infrastructure have been substantial, and governments have made long-term commitments not only in terms of financial support but also by adhering to an engineering-based development mindset, these structures now often suffer from deterioration through lack of maintenance (Varis, 2005). In addition, the financing of new infrastructure also has proved to be a fundamental barrier for water development (Falkenmark & the Symposium Scientific Programme Committee, 2005).

This situation seems at odds with the actual importance of water, but may be traced back to the dominant worldview with its economic rationalism stance that insists

on efficiency and user-pays arrangements that foster commodification (McCarthy & Prudham, 2004) and shift public perception away from seeing water as a common good that requires shared responsibility (Barlow, 2001). Prudently, water should be treated as a national asset to enable equitable sharing (Thatte, 2005). While privatisation and public-private partnerships have been recommended from *The Hague* to the WSSD, with the advantages of full cost recovery (which has issues with regard to ethicality and practicality) privatisation may lead to fragmentation (see also section 4.4.2.2) as well as single-purpose planning and management and also may have implications for transparency (Rahaman & Varis, 2005). Managing water on a purely economic basis is bound to be unsustainable (Rahaman & Varis, 2005).

The issues raised in section 4.4 have shown that the effects of making economic considerations and efficiency into guiding principles for WM are far-reaching, which goes toward explaining many of the difficulties of implementing integration in water management.

4.5 On the Potential of Integration

Overall, integration seems to make sense and is the approach of choice in many current water management situations. Making water planning and management whole and dealing with it in a holistic manner is fundamentally a sound idea. Therefore, integration in the sense of 'making whole' or 'entire' seems to be fitting for WM. The other meaning of 'integration' that pertains to 'renewal' or 'restoration' may be also be useful and should be emphasised more - bringing the water system and associated concerns back to a state that is healthy and functional may be what is needed.

Interestingly, many working examples of water management in south and south-east Asia apparently did not follow an integrated model[22] (Third World Centre for Water Management, 2002a). This gives a hint that IWM may not work in some cases or may not be applicable or implementable in the real world (Thatte, 2005), and a more realistic, suitable approach may be required. This could consist of finding ways of integrating the views of different parties and obtaining commitments, even if these are partial, to initiate compromise (Third World Centre for Water Management, 2002a). This could be a step in the right direction but would not necessarily solve the problem of a disjointed approach to water management.

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[22] However, the authors do not elaborate, so it is unclear which models they followed.

It seems that there is a need for better guidance on integration since it is not always clear what integration really means and what is actually being integrated. Is it a bringing together of all aspects that are related to water, water planning and management? The GWP definition alludes to this, if in a vague manner, and maintains that considering all aspects of relevance to water should lead to better outcomes in WM.

It is also recognised that water is pervasive and important in other sectors, such as energy, industry and business (WBCSD, 2006) and that policies and decision-making in these sectors need to consider water (GWP, n.d.-a, p.1). However, little practical guidance is available and is particularly lacking with regard to the vision and political will which are required to introduce IWM and provide governance for water institutions and systems that are participatory, fair, gender aware and able to achieve consensus (GWP, n.d.-a). It seems questionable whether integration itself can provide such guidance, which may require an even broader perspective.

Integration and IWM are challenging and complex and it is not surprising that there are difficulties with implementation. The challenges that are explicitly recognised by the GWP are that short-term costs may appear to outweigh benefits that are long-term, and that broad stakeholder involvement in decision-making does not guarantee equity and fairness (GWP, n.d.-a p.5). Other obstacles recognised are how to deal with complexity, with partial information and uncertainty, how to change inflexible arrangements into flexible ones and how to make participation work in an equitable and fair way all need further consideration. However, when looking over these and all the other difficulties outlined in section 4.4, it becomes obvious that the most fundamental problems and barriers to implementation of IWM are those related to worldview, which influence all others, but are also the most difficult to overcome.

So what does this mean for integration itself? Is it a useful concept that only needs more time, the right people, political will and better structures and processes in order to achieve it? Or does the concept itself require either modification or a thorough overhaul?

Obviously, there are no simple answers to these questions, however, the recognition that integration seems useful and valuable but that its implementation appears to be hampered by very fundamental issues, such as worldview and political will, suggest that integration could be a valuable element in a different, broader approach that addresses the fundamental barriers.

Before going into further detail, it may be instructive to compare the barriers to implementation of both integration and sustainability (as outlined in this and the previous chapter) to help identify a possible way forward for WM.

4.6 Comparison of Barriers to Implementation of Sustainability and Integration

Both sustainability and integration face similar barriers to implementation which can be divided into underlying and resultant issues in order to illustrate the dependence of the second category issues on the first (Table 4.2). Within those categories and their subcategories particular issues affecting the concepts are shown in the table.

Table 4.2: Barriers to Implementation of Sustainability and Integration

Issues	Sustainability	Integration
Underlying Perceptual Barriers		
Definition and Interpretation	Many broad, vague definitions provide no guidance for practitioners, make progress difficult to determine, open to interpretation and misuse by vested interests & distract from salient issues. 'Pillars' debate illustrates contention & misunderstanding.	Unclear definition and meaning of integration and unclear and contentious goals provide little useful guidance to practitioners. Few guidelines or case studies to illustrate relevance to local populations. Lack of issues definition prevents action.
Worldview, Attitude and Values	Many decision makers do not consider environment as basis for sustainability. Neo-liberal politics and market economics short-change environmental and social concerns. Selfishness, competition and focus on consumption neglect ecology and society	Attitudes not conducive to integration, cooperation & coordination. Lack of concern for social issues (e.g. population growth, poverty, education, human development) and societal impacts on water. Predominant economic rationalism with focus on user pays and water as property. Infrastructure and technology focus.
Resultant Institutional, Structural and Procedural Barriers		
Leadership Political Processes and Structures	Elitist political systems disempower people esp. disadvantaged groups. Community alienation of political institutions & processes precludes genuine participation. Lack of leadership and neo-liberal worldview create social and political structures and processes that pay insufficient attention to participation, cooperation, justice, equity, empathy & compassion, and disregard ecological life-base	Lack of information access & communication-friendly structures precludes transparent & democratic governance systems. Lack of stakeholder involvement prevents empowerment, education, trust & mutual respect. Vested interests can prevent progress. Lack of political will, vision, leadership, govt. commitment & legitimisation leads to inappropriate legal & institutional arrangements & resource provision.
Integration and Adaptability	Separation of functions between & within institutions causes inefficiency, duplication & prevents integration & cooperation at all governance levels. Large range of competing issues and limited jurisdiction, institutional cultures & power structures curtail innovation, collaboration & change. Inept institutional & governance arrangements can cause corruption and weak regulation and accountability.	Rational, centralised planning & management as well as inflexible, sectorised & overlapping administrative structures & authorities lead to fragmentation & lack of coordination as well as lack of collaboration within & between sectors. Organisational culture & participant attitudes are unhelpful to integration, cooperation & coordination. Inappropriate administrative structures & processes hinder adaptability.
Information Knowledge Capacity Education Complexity Communication	Insufficient/poor use of existing knowledge in areas of sustainability and interactions, ecosystem function and management, understanding of change, systems & cycles, behavioural, technological and institutional aspects and management policy leads to lack of meaningful action and behavioural change. Lack of appropriate training for personnel, capacity building in institutions and public education prevent awareness and progress. Lack of communication prevents information distribution and collaboration.	Inappropriate training, insufficient capacity building & understaffing prevent dealing with all factors in complex human-land-water-waste system. Simplistic account of water issues results from neglect of spatial and temporal scale & local knowledge. Predominance of natural sciences and engineering over social sciences means lack of capacity in human dimensions. Lack of data & info exchange/dissemination prevents action. Disregard of local issues leads to low success in technology & management transfer. Public education is curbed by inappropriate language & unwritten media rules that limit info dissemination
Economics and Finance	Profit thinking & continued economic growth, lead to misalignment of economic incentives & market failure & prevent sustainability. Disparity between rich & poor & lack of economic power harm society & cannot be sustainable. Under-funding & -investment in development and technology diffusion prevent action and implementation of sustainability	Short-term economic agenda disregards long-term environmental change. Water as economic good & property and full cost recovery prevent integration. Poverty and lack of education harms economy, society and environment and hinders integration. Lack of funding and resources, lack of finance for and maintenance of water infrastructure & high cost of integrated projects prevent integration.

Note: table contents have no claim to completeness and represent a selection of issues pertinent in the literature reviewed for this thesis.

Both concepts suffer from definitional issues, albeit these seem to be more pronounced in sustainability. This is perhaps due to its (perceived) broader applicability and more pronounced vested interests throughout society as well as the longer (though recent) popularity of the concept compared with integration. The perception that sustainability has a broader concern encompassing the whole environment compared to integration, which is 'only' dealing with water, could have resulted in more controversy in wider circles.

Overall, worldview seems the most fundamental barrier to the implementation of both concepts since worldview and its associated beliefs and values determines behaviour and influences the structures, actions and processes of all the subsequent issues and subcategories in which barriers have been identified. The issues pertaining to worldview seem very similar for both concepts, with the predominant belief in economic rationalism and associated values leading to relative inattention of social issues.

The lack of environmental concern in integration is expressed indirectly through an infrastructure and technology focus that, in turn, seems less pronounced in sustainability. This may reflect the 'environmental' nature of water, making such concerns less explicit in integration.

Directly related to worldview is political will, which determines the decisions that are made regarding the political system, institutions, processes and resources as well as other changes to enable the implementation of sustainability and integration. Most of the issues in the other subcategories are influenced by this, directly or indirectly. Clearly, worldview is not only an influence on politicians but also on other decision makers, whose attitudes can determine systemic, procedural and other relevant issues, but often these are also influenced or bound by political realities.

There are some issues, such as those pertaining to knowledge and complexity, which pose their own difficulties, but decisions to provide adequate resources and support could go a long way to help address many of these problems.

In sum, there are differences in detail in the barriers to implementation of sustainability and integration, but overall, the same issues prevail: inappropriate worldview and associated lack of political will, organisational culture and inappropriate/inadequate decision-making resulting in lack of support and funding.

4.7 Conclusions

Both sustainability and integration are increasingly popular ideas that could contribute to human wellbeing and 'planetary health' if they were fully implemented. However, despite ample rhetoric, also effort and some achievements, particularly on the part of the more practically orientated integration, real progress has been elusive. This lack of success can be traced back to many problems and barriers, most of which can be directly or indirectly associated with a worldview that is not conducive to either concept and has priorities that undermine the efforts of implementation in both. In addition, the concepts themselves could gain from more clarity in definition to reduce some of the potential for misinterpretation and give more practical guidance for implementation.

Accordingly, a change in worldview would be required to one that accepts the environment as the basis for human existence and wellbeing. As Reitan (2005) points out, a worldview is not practical and needs changing if it does not elicit behaviour that improves on the *status quo* in the long term. While those barriers relating to worldview are probably the most difficult to address, they would also have the most influential effects and, arguably, without a change in worldview most of the other larger changes that are required to progress in the direction of sustainability and integration may not be forthcoming. How can a change in worldview be achieved? A new idea that is sufficiently compelling may be needed as a catalyst for such change and will be outlined in the next chapter.

Chapter 5
The Water Society:
Ideas and Principles

5.1 Introduction

> Leonardo da Vinci, the eminent Renaissance scholar and philosopher, said, 'water is the driver of nature'. Many people in the past have considered it to be an over-statement, but at the beginning of the third millennium, it is difficult to disagree with Leonardo's views. During the past five years, water has been increasingly considered to be one of the most critical natural resources issues for the early part of the 21st century. Analyses of all the current water-related trends indicate that the overall global water situation, at least for the next decade, if not longer, is likely to deteriorate even further. (Tortajada, 2005 p.1)

Many authors and institutions (exemplified by the current UN Decade of Water) acknowledge the significance of water as the "giver of life" and call for higher importance being placed on the (sustainable) management of water. Throughout the world such initiatives so far have fallen short of their aim to achieve secure and healthy water supplies for all in the long-term (Biswas & Tortajada, 2005). One of the reasons for writing this dissertation is to help find ways to address this situation.

The second chapter of this thesis highlights the general neglect and lack of understanding of psychosocial aspects or human water needs and the values of water by WM practitioners as well as the wider community. Because values are an important part of a person's worldview, addressing the existing confusion about the concept of values can have wide-ranging consequences. Since values can only reside in people and indicate importance, values of water represent what water means to people and what it is used for. The extent of the values of water and the interconnections and interrelationships with each other and with most aspects of human endeavour highlights that virtually all human endeavours and what humans aspire to, directly or indirectly, depend on or are connected with water.

While the dominant Western worldview stems from the desire to fulfil many human wants as well as wellbeing and happiness, its limited scope and reductionist view is focussed on the individual and seems to value competition, profit and private property over collaboration and cooperation. The undervaluation of the environment as the basis

for human and economic development and wellbeing is perceived as one of its greatest drawbacks (Brohman, 1995; McCarthy & Prudham, 2004). This extends to water, specifically its *central* role being little appreciated in socio-economic development, directly as a means of production and indirectly as the most important prerequisite for natural environment functioning and human health, which in turn are the basis for ongoing economic development. This lack awareness and understanding includes that of politicians, decision-makers and the general public (Falkenmark & the Symposium Scientific Programme Committee, 2005).

A particular issue is that water is seen as only one resource of many that needs to be managed sustainably, which may have led, despite attempts at integration, to a scattering of efforts and resources and the undervaluation of water. Current trends towards commodification of water also do not do justice to the importance of water but rather aid in distancing ourselves from this special substance (see section 2.1.2.3). In short, despite acknowledgement that water is of crucial importance for life and human activities, we find that governance, policy and practice do not adequately follow suit. Hence, the question is asked: is there a practical and feasible way in which water can be afforded the status it arguably should have?

In the present chapter, it is suggested that this might be done by explicitly acknowledging or foregrounding the central role of water in society, its psychosocial, socioeconomic and biophysical importance, and by viewing society, all human activities and needs as well as the ecological life support of the planet, through a 'water filter'. It would mean accepting water as the basis of, or at least considering water in a central capacity in, policy, legislation, regulation, planning, project design and decision-making in all areas of government, business and the wider society. Such an approach could be called '*Water Centrality*' and a society applying such principles a 'water society'.

The aims of this chapter are:

- to argue the case for a different focus or filter for society – that of water – as a potential way of addressing the current shortcomings of sustainability as well as sustainable and integrated WM;

- to outline the characteristics of, or a preliminary 'vision' for, a society that recognises water as the substance of prime importance and makes it a central concern; and

- to draft principles that can be used as the basis for the evaluation and design of structures, processes and instruments to help ensure that water is of central concern and is acknowledged and considered as such throughout society.

5.2 A Case for *Water Centrality*

Although sustainability provides a worldview that brings together many previously unrelated ideas and disciplines, "those using this perspective, including the Brundtland Commission and participants at the Earth Summit among many others, have come to the conclusion that "the current nature of human activity is inadequate for meeting current needs and is seriously undermining opportunities for future generations" (Hardi & Zdan, 1997 p.9).

> Implementing a commitment to sustainable development entails a substantial transition not just to a broader understanding and a more ambitious set of objectives, but also to more coherently interrelated institutional structures and processes of planning, administration, markets, tradition and choice on every scale (Gibson, 2001; Parto & Doloreux, 2003). Clearly, this is not a transition that can be accomplished quickly or easily. The challenge is to show how such a transition can be accomplished and to develop a core set of tools that would make governance for sustainability manageable. (Kemp, Parto & Gibson, 2005 p.17)

Arguably, such a transition and the prerequisite for developing appropriate tools that are essential for implementation, can only be achieved by changing the current dominant worldview (see Chapter 3 and 4). This may entail the presentation of compelling arguments that should have a universal basis, are far-reaching, easily understandable, accessible and relevant to all. Achieving such an extensive task seems only conceivable with the help of something that is widely known already and has general appeal. One of the few issues or substances suitable as a basis for such arguments is water.

To begin with, virtually every human being knows that water is important, and this message should be easily reinforced and expanded upon. The importance of water for sustainability has been well established and integrated water management was devised because of the necessity to take account of the interconnections of water with other areas, so there are many theoretical resources and practical examples already in existence. Various authors have also highlighted the ability of water to transcend many different issues, pleading for a change in its status. For example:

> Prudent 'development and management' of freshwater alone helps mankind cope with natural variability besides meeting with human and ecosystem needs, and as such should be on the world's agenda related to society's wellbeing, economics, and related policy. (Thatte, 2005 p.69)

Or:

> Water resource issues are complex and transcend the water sector itself: indeed, there is an urgent need to broaden the horizon of water issues outside of the water sector. Macro-economic development, population growth and other demographic changes have greater impacts on water demands than water policy. This emphasizes the importance for water professionals to increase their understanding of broader social, economic and political contexts, while politicians and other key decision-makers need to be better informed about water resource issues. Otherwise water will continue to be an area for political rhetoric and lofty promises instead of implementation of sorely needed actions. (UNESCO World Water Assessment Programme, 2003 p.383)

This statement calling for greater importance to be placed on water and to broaden our understanding about it indicates a fundamental flaw in current water resource management: the separation of water from areas that it should be integral to, despite attempts at integration (Falkenmark & Folke, 2002).

Another argument calls for water management to change fundamentally from being crisis-driven to being proactive (Falkenmark & the Symposium Scientific Programme Committee, 2005). This reasoning maintains that, although not perfect, we have sufficient knowledge to be able to do this, but a change in awareness is needed. On the one hand, we have to accept that every person has to take responsibility and that government and other institutions are there to support and facilitate this, as the World Water Vision (Cosgrove & Rijsberman, 2000) calls for; and on the other, we have to acknowledge water as the lifeblood of the biosphere and treat it as an asset (Falkenmark & the Symposium Scientific Programme Committee, 2005; Folke, 2003Falkenmark, 2002 #1123; Ripl, 2003).

These examples may be indicative of a change in attitudes toward water management as well as water itself and its values (see also Chapter 8), reflecting the reality and growing awareness of increasing water shortages and unpredictability of supply across the world. However, so far, the responses have been predominantly reactive, rather than proactive. Most also do not reflect the total dependence of society on water as demonstrated by the values of water. While some of the new developments are promising, particularly the 'hydrosolidarity' concept by Falkenmark and Folke

(2002), they may need to be broadened and may profit from a galvanising idea or vision to unify their efforts and advance the progress in water management to, ultimately, move toward the ideal of a world in which humans live harmoniously *within* their surroundings.

Such an idea or vision should be based on water, or more precisely, it could be provided by water itself. While the foundation of that idea is based on the pervasive importance of water, of which a very basic outline is provided in the following section, it ultimately takes a step further the arguments mentioned earlier in this section. If water is the basis of life and the biosphere, and virtually all human and social activity relies and depends on it, then it should be acknowledged as the basis of society and made a truly *central* concern; the *reality* of water as the basis for society should be recognised. That means that not only society's ethical and values base, but also its governance and structure as well as its economy would have to be organised accordingly.

A preliminary outline of what such a society could look like and what would have to change are outlined further in this work, but first it seems necessary to briefly recap the importance of water for society since the extent of this is rarely fully appreciated[23].

5.2.1 The Importance of Water for Life, Society and Everything

The importance of water is intuitive and compelling. Life began in a water environment and cellular life still functions within it (Capra, 2003). Water is the basis for biological life, as we know it (Ripl, 2003; UNESCO World Water Assessment Programme, 2003) and has been called the 'bloodstream of the biosphere' (Falkenmark & Folke, 2002; Folke, 2003; Ripl, 2003) because of its unique properties and its pervasive presence in all processes important for life – from the cellular to the planetary level.

Other roles of water include those in the formation and function of proteins, as universal solvent, lubricant, transport mechanism, facilitator of chemical reactions, cleansing fluid, waste removal agent, structural agent (e.g. it enables flowers to hold their heads to the sun), to name a few (for some fascinating reading with many, often less known details about water and associated aspects see e.g. Ball, 2001; Falkenmark & Folke, 2002; Marrin, 2002). Water appears to be instrumental in the formation of stars

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[23] There is no claim to completeness, which would be impossible to achieve in a single section in a thesis.

and planets such as Earth (Marrin, 2002). Work is under way toward understanding the quantum nature of water which still poses puzzles for scientists and mathematicians (e.g. Donchev, Galkin, Illarionov et al., 2006). And, although not necessarily scientific in the accepted sense, work by authors such as Emoto (2004; 2005), Schwenk (Schwenk, 1996) and Schauberger (Bartholomew, 2003) may also be able to provide insights into the functions and characteristics of water as well as other more philosophical and mystical aspects.

The water cycle is one of the main ecological processes providing essential transport, cooling and reaction functions. It is coupled with material flows, which, in turn, are closely bound to vegetation, forming intricate localised, high frequency water cycles that work even without precipitation (Ripl, 2003). Ripl (2003) argues that reducing human interference with these fundamental balancing processes is essential if sustainability is the declared goal.

Water is pivotal in soil formation; without it there would be no weathering of rock, and minerals would be available to plants only to a very limited extent. Water is the substance in which life first formed and in which those life forms (stromatolites) live that first produced oxygen ("air") that enabled more complex organisms to move onto land. We still depend for oxygen production on plants and algae, which in turn depend on water to live.

Water is crucial in the complex processes which make up climate and weather. This includes water vapour in its role as a greenhouse gas that contributes to global warming. Conversely, some types of clouds and terrestrial liquid water bodies can help cool the atmosphere. Although this has been known for a long time (Miller, 2005) there is also much uncertainty about these effects which are only slowly starting to be fully recognised and acknowledged. Water is not only important in the control of fire but also for the intensity and frequency of fire, while water flows are affected by fire through the effects on soils, loss of vegetation and eventual regrowth (e.g. Chafers, 2007; Falkenmark & Folke, 2002).

Water is also central to food production (SIWI et al., 2005) (Falkenmark & Folke, 2002). Soil water is the foundation for achieving food security worldwide, and has been recognised as the basis for the new 'agricultural revolution' (SIWI et al., 2005). Fundamentally, water is at the basis of all ecosystem services (Falkenmark & Folke, 2002; UNECE, 2005) and although the full extent of these findings is rarely

appreciated, there is growing recognition that the provision of water is critical for proper ecosystem function. It is the basis for livelihoods and economic wellbeing in the form of resources, such as food, building materials and medicines, as well as important hydrological functions, such as flood protection and good quality water, besides supporting biodiversity (Wallace et al., 2003).

Many of these functions are not fully considered in WM, leading to, for example, a general disregard of at least two thirds of the water cycle; mostly only 'blue' or liquid water being taken into consideration in WM while other forms of water such as rain and evapo-transpiration, so called 'green' water, are not considered (Falkenmark, 2005).

> Taking a step back in the water cycle to the rain over the continents, it is now being realised that most rain goes as consumptive water use by the vegetation back to the atmosphere. Much of the interest of the water expertise has in fact been concentrated on how to use beneficially only 4 percent of the available resource. Out of the vapour flow, about 10 percent is consumed by crop production which is almost twice as much as all the blue water withdrawn for societal use. Most of the remaining 90 percent is consumed by other terrestrial ecosystems. (Falkenmark, 2005)

In early 2006 the Green-Blue Initiative (GBI) was launched by a group of international partners consisting of the Stockholm International Water Institute (SIWI) and the Stockholm Environment Institute (SEI), the IWMI and the International Food Policy Research Institute, the World Conservation Union (IUCN) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) to further develop the 'green-blue paradigm' (Berntell, 2006). The initiative is based on the realisation that water planners have been working with a partial reality relying on limited blue water data sets that provide an insufficient basis for addressing the full range of water management requirements related to investments, livelihoods, poverty alleviation and environmental sustainability. The GBI includes local to global considerations to support the global effort for a more comprehensive water-food-ecosystem agenda (Berntell, 2006).

While this new approach to WM finds increasing acceptance and should be commended, it is limited to a part of the social-ecological system and neglects others, e.g. industry, business, military and recreation, to name a few. Other important elements of the freshwater cycle also seem generally neglected, such as water vapour, by itself as air humidity and in the form of clouds, as well as glaciers and ice sheets together with

their associated cycles and interactions between the green and blue elements and other associated cycles.

Glaciers and polar ice caps until recently were primarily considered with regard to global warming, associated melting and retreat resulting in sea level rise. The function of glaciers as a water reservoir for the dry season and their role in temperature control as well as the role of ice caps for the maintenance of ocean and air currents as well as climate and weather patterns is only slowly gaining recognition (Miller, 2005). Climate change affects the frequency and extent of extreme weather events such as droughts, floods and storms which are critical to the economy and society (IPCC, 2007; Kundzewicz, Mata, Arnell et al., 2007; Varis, 2005; Wilbanks, Romero Lankao, Bao et al., 2007).

The oceans are also often neglected as a part of the freshwater cycle; they are, arguably, the driver of weather and climate (Ball, 2001) and it is where most rain originates, but it is also where many waste products end up via rivers (some of this accumulating in the food chain that terminates with humans). They provide large amounts of protein through various fisheries, which are increasingly impacted by the reduced water flow in rivers (caused by damming or excessive water extraction) and associated lack of nutrients (Huntley, Leeks & Walling, 2001; Kremer, 2004; Syvitski, Vorosmarty, Kettner & Green, 2005). It is also often unclear if and how grey and black waste water[24] are considered.

Virtual water refers to water embedded in products which can be transferred through trade. This can be the basis for an argument for water management on a global scale since many countries are dependent on virtual water, especially the industrialised nations that often cannot produces sufficient food for their people. Water vapour flows are also being impacted on by humans on a global scale (Gordon, Steffen, Jönsson et al., 2005) through such activities as deforestation and reforestation (Zomer, Trabucco, van Straaten & Bossio, 2006), irrigation and increased carbon dioxide emissions that have the potential to affect climate and weather patterns (e.g. the Asian monsoon) with consequences for ecological and human systems.

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[24] Waste water is commonly separated into black water, which is water contaminated with faeces that originates from flush toilets, and grey water, which is household waste water from the kitchen sink, shower, hand basins and washing machines that is less contaminated and does not contain faeces, requires less intense treatment and can be reused in some circumstances without treatment for garden watering.

Often the allocation of water has underestimated or neglected indirect human uses with their long-term benefits in favour of the more short-term gains through direct water use in highly managed systems (Wallace et al., 2003). Installations such as reservoirs and dams, irrigation schemes, embankments and water treatment plants with clear social and economic benefits through increased crop production, electricity generation, industrial products, flood protection and clean water provision also generally cause negative impacts, especially downstream, which raises severe doubts about their sustainability (Wallace et al., 2003) (see also Chapter 2).

In this context, it is interesting to note that while most water management is concerned with the distribution of water with regard to irrigation use, urban centres, industry and power generation, it is focussed on addressing insufficient or limited supply and its redistribution. The issue of 'too much water' is not at the forefront of the minds of many people, although this is changing in many parts of the world where, due to climate change more extreme weather events are causing more severe floods. The impacts of such natural events are often exacerbated by settlement patterns that do not take into account existing floodplains as well as engineering works that force water into channels that hinder the natural spread of water and force it along with increased speed.

In addition, fifteen years of Stockholm Water Symposia have highlighted the importance of water as a catalyst of socio-economic development, in global food security as well as for household water supply and sanitation (Falkenmark & the Symposium Scientific Programme Committee, 2005). But besides its importance for survival, meeting basic human needs and its central role in the maintenance of livelihoods, directly as well as indirectly, water also has important roles in all other areas of human life. These include recreation, relaxation and aesthetic experience (Wallace et al., 2003). Water also was, and is, an important part of philosophy and spirituality (McAnally, 2004) as well as in aesthetics and the arts (Simus, 2004). Although much more prevalent in historic times, water still has a central role in worldviews and religions as a sacred medium and life force (Goode, 2003; Marrin, 2002; Strang, 2004; UNEP Millennium Ecosystem Assessment, 2005; Yu, 2000).

> Everyone understands that water is essential to life. But many are only just now beginning to grasp how essential it is to *everything* in life – food, energy, transportation, nature, leisure, identity, culture, social norms, and virtually all the products used on a daily basis. With population growth and economic development driving accelerating demand for everything, the full value of water is becoming increasingly apparent to all. (WBCSD, 2006 p.4 original emphasis)

Further, water is critical in addressing externalities such as population growth and urbanisation, human development, decentralisation and empowerment, governance and policy, poverty, food security, climate variations and environmental degradation, but while recommendations to address these through integration and appropriate policies have been made, so far this has not lead to substantial results (Varis, 2005).

While the role of water for life, functioning ecosystems, human livelihoods and wellbeing is increasingly recognised and acknowledged in various declarations and publications (e.g. de Villiers, 2001; European Commission, 2002; Falkenmark & Folke, 2002; Falkenmark & the Symposium Scientific Programme Committee, 2005; Postel & Richter, 2003; UNDP, 2004; UNESCO World Water Assessment Programme, 2003; World Water Council, 2000a), there seems insufficient action to follow up these insights.

Water is such an important substance (arguably *THE most important* substance) for planet and society, that it can be argued that water should not only be integral to all resource management considerations but also to economic, environmental and social decision-making and everyday life at all levels, from private to global. Acknowledging this 'water reality' we should become a 'water society' which makes water a central concern and its prime decision-making base.

5.3 A Water Society

Given the fundamental importance of water for life and society, it is only a relatively small but logical step to acknowledge this importance – this 'water reality' – and strive to **make water the focus of society**. Water has always been and still is "a metaphor of social, economic and political relationships - a barometer of the extent to which identity, power and resources are shared" (Strang, 2004 p. 21). Therefore, water should be accorded the place it arguably should have in the scheme of things – as the prime substance of life and foundation of society - which would entail **making water central to everything we do and to take it into account in every decision we make at all levels of society**. Such a stance could be termed '*Water Centrality*'.

An Internet search with the Google search engine for "water reality" found 9280 entries (17 December 2007). These entries vary widely and, while not all relevant to water management (even in a wider sense), confirmed that while water imposes a reality on life there exists no single reality. These realities can differ considerably (G. Albrecht,

personal communication, December 2007) making 'water reality' a broad and rather imprecise term.

A different Google search for "water centrality" did not come up with any matches, indicating that '*Water Centrality*' is a unique term. 'Centrality' also highlights a central role that signifies importance, which 'reality', although it implies a 'fact' or 'truth', does not express.

An Internet search for 'centrality of water' with the Google Internet search engine returned 691 entries (21 December 2006). Many of these referred to UN publications and speeches associated with the 2003 World Water Forum, in particular a speech by Kofi Annan, who reiterated what Nelson Mandela had said a year earlier on the centrality of water for human survival and sustainable development:

> Amongst the many things I learnt, as a president of our country, was the
> centrality of water in the social, political and economic affairs
> of the country, continent and indeed the world.
> I am, therefore, a totally committed "water person".
> *Nelson Mandela at the World Summit on Sustainable Development, 2002*

The other entries represent a collection of sources of which most have a clear message: water is central for survival, for the environment, the economy and society, but it is also central in other respects e.g. spirituality, human rights and culture, as well as conflict. What many of these sources also acknowledge is that the centrality of water for life is often not appreciated until water supplies are interrupted. However, they do not seem to appreciate the 'depth' of the centrality of water; that water *pervades* our lives.

As the UNESCO points out "the water crisis is essentially a crisis of governance and societies are facing a number of social, economic and political challenges on how to govern water more effectively" (UNESCO World Water Assessment Programme, 2003 ch.15 p.370). Action must be taken so that effective governance of water is expanded to truly reflect the central importance of water for society.

There is growing recognition of the centrality of water, expressed in various contexts, for example landscapes (Gandy, 2006), transboundary water conflicts (Blatter & Ingram, 2001) and global water initiatives (Varady & Iles-Shih, 2008), highlighting some of the interconnections. Loucks and Gladwell (1999 p.7) demand that: "water resources systems must be considered an integral part of a changing societal system.

The interactions of the system with society and environment must be taken into account by experts from all appropriate disciplines". Furthermore, Brown (2003a) asks for population growth and resource consumption to be restrained while increasing water productivity. Water is recognised as an increasingly scarce resource and adjusting to this scarcity will influence "what we eat, how we dispose of waste and even where we live" (Brown, 2003a p.113). However, *Water Centrality* would need to go further than adjustment and awareness.

This proposal builds on the Dublin principles, which have worldwide acclaim and were put together through an extensive consultation process (GWP TAC, 2000). It extends other projects such as the Global Water Systems Project (GWSP) and the Earth System Science Partnership (ESSP). In reality, it is a relatively small conceptual step forward from the work done by the SIWI and others (e.g. Folke, 2003), expanding their insights concerning the role of water in food production to other areas of human interest, indeed, encompassing the whole of society. This also means that there is a knowledge foundation on which *Water Centrality* can build and existing expertise that can be utilised.

A selection of water-related initiatives and concepts is listed in Table 5.1. All recognise the importance of water and make a contribution to water management and awareness that goes beyond the 'usual' approach to water management and/or have a different perspective. The efforts of the projects are valuable in that the knowledge and awareness generated through this work increases the level of awareness and knowledge about water and *Water Centrality* can build on that. It may be beneficial to unite these initiatives under the umbrella of *Water Centrality* in order to increase scope, cooperation, interaction and efficiency while maintaining individual qualities and activities of the various initiatives and projects, where appropriate.

Table 5.1: Selection of Water-related Initiatives Valuable for *Water Centrality*

Concept	Author/ originator
Integrated Water Resource Management	Global Water Partnership
Hydrosolidarity Green-Blue-Initiative	Stockholm International Water Institute
Hydrology 2020	International Association for Hydrological Sciences, Hydrology 2020 working group http://hydro.iis.u-tokyo.ac.jp/H2020/
2nd World Water Development Report: *Water, a shared responsibility*	UNESCO – World Water (UNESCO-WWAP, 2006)
World Water Vision: *Making Water Everybody's Business* - World Water Actions - Water Voice	World Water Council http://www.worldwatercouncil.org/index.php?id=192
Red-white-red Water Charter, Austria: *Our Water – Our Future*	Ministry for Life, Austria WATERnet http://www.wassernet.at/article/archive/1460/
Water Innovation *– A New Era for Australia*	Bowmer (2004b)
The Water Manifesto	http://www.f1boat.com/99/watermanifesto.html (Committee for the World Water Contract, 1999)
Our Water Future – State Water Strategy	Government of Western Australia (2003)
Water*mark*	Victorian Women's Trust (2007)
Blue Planet Project	http://www.blueplanetproject.net/ Maude Barlow, founder
Waterlution – evolving our relationship with water	http://www.waterlution.org/
Water variability	Gibbs, 2006

A report by the Stockholm International Water Institute (2005) calls for a paradigm change on the role of water in food production and security. The authors recognise the key role of water in food production and propose policy changes with regard to governance, capacity building and awareness raising as well as financing and others to facilitate secure food supplies and, by default, appropriate water systems management. The report recognises that "ingenious management and sound stewardship of the entire water resource is required" (SIWI et al., 2005 p.7). This includes blue water, contained in water bodies and aquifers, as well as green water, contained in soil as moisture not obvious to the naked eye, and rain, a renewable water source that is often undervalued for food production. The SIWI calls for new ways of valuing water from the social, economic and ecological perspectives so that better choices with regard to the use of green and blue water are made possible to establish the new paradigm for

global food security (see also Chapter 8). While this stance approximates *Water Centrality* in the area of food production, it would need to be broadened to other areas, as indicated below.

The latest Human Development Report (UNDP, 2006) is focussed on water and recognises the importance of water for socio-economic development. Its title, *Beyond Scarcity: Power, Poverty and the Global Water Crisis,* highlights this inextricable link between water and wealth while the report itself outlines the broader context of water scarcity and lack of sanitation.

The 2nd World Water Development Report, *Water, a Shared Responsibility*, reiterates the central role of water in socio-economic development and poverty alleviation, the inextricable links of water with health, food production, livelihoods, industry and energy production, and recognises the water crisis as essentially being a governance crisis. It recognises the fundamental role of sound knowledge based on exchange and respect of values, and envisages water as a catalyst for cooperation and equity while acknowledging the importance of integration (UNESCO-WWAP, 2006).

Young members of the International Association of Hydrological Sciences formed the *Hydrology* 2020 group to find ways to redress the neglect of hydrology in water management. In their final publication they offered this insight at the end of the second chapter that reviewed the global water resources:

> A cardinal change in the attitude of people to freshwater is the most important prerequisite for joint efforts in the solution of water problems in the world. Freshwater should be recognised everywhere, at each level, first, as the most valuable natural resource without which the prosperity of humankind and global economic development are impossible; and second, as the most important vital component of the environment. It is necessary to develop effective international agreements, strict legislation and governmental decisions on the protection of water bodies, effective water use, provision of a human right to water, and water pricing, and to place greater emphasis on coordinated public and private initiatives to find solutions to water problems. It is essential to develop a strategy for water resources management as a multipurpose and long-term programme for human activity in each region to achieve a sustainable water supply. (Balonishnikova, Heal, Fu, Karambiri & Oki, 2006 p.38)

This quotation strikes at the heart of what seems required to improve WM globally, however, the following changes are suggested: *first*, water should be recognised "as the most vital component of the environment", and, second, as the most valuable natural *asset* without which the *wellbeing* of humankind is not possible.

These suggestions could go a long way towards putting water at the top of the agenda, and encompassing the whole of society. **Water should be made the central consideration in everything humans do and be part of every decision**. This would mean that governance is based on water and, in short, it would need a shift in worldview making it essentially a 'waterview'.

A water society would be using water as its base currency - its measuring stick, yardstick, measure, benchmark, standard, point of reference, criterion, paradigm, principle, norm, ideology, tenet, rule, imperative, constraint and obligation. This would include water pricing but would be much broader than merely monetary valuation and at the same time could be a way of adjusting society's ethical base.

A water society would need, at the very least, to respect and value water highly, but could go further and acknowledge a fundamental spiritual connection with water beyond the symbolic meaning ascribed to it by the major religions (see 2.2.1.11). The reverence for holy rivers and other water bodies as well as the 'singing to the land' (and water) of the Australian aboriginal people, and even praying, take on an extra dimension if the work by Emoto (2004; 2005) on water crystals were to be taken seriously. He suggests that water is influenced by music, words, thoughts and emotions and is kept healthy or can be healed and cleansed if treated with respect, gratitude and love.

While there may be doubts about the scientific rigour of Emoto's work, it is remarkable in its apparent popular success[25]. This popularity seems to affirm the affinity that people have with water (not necessarily or not only at an intellectual level) (Strang, 2005), acknowledging its importance and uniqueness, and the willingness to give it more credence, meaning and standing than it enjoys at present in modern (Western) society. This potential to value water more highly would need to be translated into practice (see Chapter 8).

Water Centrality could be useful for acknowledging the special status of water both as a substance and in the human psyche and cultures. It represents a change in attitude towards the value of water and acknowledges it as the 'lifeblood of the biosphere' called for by Ripl (2003) and (Falkenmark & Folke, 2002). A focus on water, and its life-giving properties, should ensure the wellbeing of all life forms in

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[25] Emoto's 2004 "Hidden Messages in Water" was a New York Times bestseller and USA Book News Best Book 2004; he is giving seminars worldwide and has published numerous books on the theme and

ecological and social systems as well as ongoing provision of ecosystem services and other functions, and, therefore by extension, economies.

Through valuing water more highly, *Water Centrality* would mean a change of attitude towards water from one that regards it as a commodity to one that considers it to be the most important substance for humans on this planet; something much more fundamental, not marketable or tradable in the common sense (Barlow, 2001; Committee for the World Water Contract, 1999) (see 2.1.2.3). Taking this thought to its conclusion may trigger a change in the present economic system into one that includes or is based on 'water accounting' or a water credit system that has an ethical base (see Chapter 8 for details). Thatte (2005) has called for full integration of the water resources sector into the economic system, although, arguably, it should be the economy that should adjust, steering away from using only one type of value, that of money and putting profit before everything else, which, besides creating wealth and wellbeing for many, has also caused much human misery and environmental degradation (Hartwick & Peet, 2003; McCarthy & Prudham, 2004).

Similarly, Varis (2005) has recognised that water is crucial in addressing population growth and urbanisation, poverty and food security, human development and empowerment, decentralisation, governance and policy, climate variations as well as environmental degradation, which should be addressed through integration and appropriate policies. Heeding the call from both Thatte and Varis, and affirming the interrelatedness of water with these important and basic elements, it seems logical to focus the efforts of society on water. *Water Centrality* should be a suitable vehicle since it addresses, or provides for addressing, all these aspects.

Water has the potential to reconnect the global quest for sustainability with the everyday reality of living by illustrating the interconnectedness of humans with the environment in an accessible manner. While this assumption may have to be proven, there are indications that people have an innate connection with water that seems to transcend cultures (Marrin, 2007; Strang, 2005). Therefore, *Water Centrality* could prove more tangible, unambiguous, accessible and understandable for everyone rather than sustainability. Building on this bond, *Water Centrality* and its principles may make it easier to address some of the shortcomings of sustainability identified by the UN Millennium Ecosystem Assessment (MEA) (2005), increase human and institutional

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sells merchandise associated with the water crystals, i.e. CDs, DVDs, pictures, cards etc. (e.g. see

capacity for assessing and managing ecosystem services and help generate more investment in regulation and management regarding their use. It should assist in increasing the awareness of the general public as well as decision makers about the threats of ecosystem degradation and also the opportunities that water central ecosystem management can provide.

While *Water Centrality* is an anthropocentric approach (by necessity, due to its human origin and aim of human wellbeing) this anthropocentricity is comparatively weaker than that of sustainability since the focus is shifted from people to water. Arguably, *Water Centrality* is a balanced, holistic approach that ties people firmly in with their surroundings *via* water. It provides the basis for a values change that seems required to keep life support systems operational and effective.

A focus on water would help highlight the role of water in ecosystems as well as social systems, illustrating these complex issues in a more unified way. It could assist in the maintenance of well-functioning ecosystems while meeting humanity's biophysical and psychosocial water needs - both direct and indirect. For example, a water central business would address and incorporate the values of water in economic and non-economic terms in an interrelated manner that would include financial considerations and economic concerns but only in conjunction with social and environmental elements; all with a common link to water.

It has been argued that the aesthetic appreciation of water should change from one that focuses on what water is (what it looks, feels, smells and sounds like) to one that focuses on how water functions in a catchment. Adding to this some quantitative analysis, the basis for a new metric for water quality determination could be established (Simus, 2004). This philosophy supports *Water Centrality* and could be extended to include how water functions within organisms of humans and other living entities.

Adopting the view of *Water Centrality* would entail not only a change in our values base, but also our governance structures, mechanisms, institutions and processes including decision-making arrangements. It would mean adapting these for the central consideration of water as a priority before the economic, financial, social or other bases decisions are made. If this were to prove untenable then water should be at the very

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http://www.beyondword.com/emoto-books-and-products.html)

least an equal factor with equal weight in such decisions. These changes would flow into management, administration and social structures, the economy and everyday life.

In order to anticipate and mitigate unpleasant surprises and negative effects it would be advantageous to make water a central consideration in all human endeavours. That would mean to make water a priority (but not sole) issue in considering how we live; it would mean assessing how our lifestyles, buildings, gardens, transport options, healthcare systems, industrial and economic activities etc. are affecting water, and are affected by water, and how we can redesign them to be conducive to healthy water systems and, therefore, to life. This would also entail taking 'too much' water and other destructive or disease vector characteristics of water into account, with all the negative as well as positive aspects. It would mean foregrounding water in all decisions about all aspects of life, so that the central importance of water is reflected in any decision outcomes.

Water Centrality requires working together in partnerships and cooperation on and between all levels of society, ideally around the planet. This could be done possibly along the lines of the ideas advocated by the signatories to *The Water Manifesto* (Committee for the World Water Contract, 1999) that include 'partnerships of water' between local, national and global levels as well as private and public players in a 'Network of Water Parliaments'. The details of such partnership(s) can only be arrived at in a participatory process that requires clear, strong focus and wide support. Government and other institutions should be accessible, diverse, adaptable, transparent, informed and shared.

Since a society pursuing *Water Centrality* would make water its priority, government agencies would have to be restructured and new decision-making processes instigated to accommodate *Water Centrality* requirements. Water concerns would have to be integrated into all government sectors rather than having a separate 'department of water' that perpetuates the separation of water from other sectors. Perhaps the head of state could be responsible for water and be the ultimate decision-making authority. All decision-making processes would need to ensure that they have at their heart the satisfaction, or at least the consideration, of the values of water; those concerned with water directly, in all its forms, and those that deal with budgets, social welfare, education or other issues at present often mistakenly seen as unrelated to water.

Seen from a water central perspective, for example, global warming would need to be curbed because of its effects on water cycles at all levels with ensuing potentially severe effects on ecosystems and society. Effects that may be less obvious are, for example, the reduction of hydroelectricity production due to water shortages (e.g. Norway in 2005), which in turn leads to more fossil fuel use resulting in increased greenhouse gas emission, or the shut-down of nuclear power plants (e.g. in France in 2005) because the river water is too warm to use as cooling water.

Agricultural systems, business and industry would need to adapt to *Water Centrality* as would transport and energy systems, healthcare and other community services, as well as science and education. The military, the arts, sports and religious organisations also would need to adjust. This does not only mean the conservation of water and prevention of water pollution but also taking the effects on water cycles and water values into consideration in the design, operation, management and decommissioning of facilities and the planning and execution of activities. These effects may not be obvious at first glance since many are indirect, hence, mechanisms and processes would need to be established that facilitate their consideration.

The request that: "it is time for businesses of all sectors and sizes to add water to their strategic thinking (WBCSD, 2006 p.4)" should be changed to: 'it is time for businesses of all sectors and sizes to make water *the basis* of their strategic thinking'. The demand for a recognition of the central role of water in agriculture and food production (SIWI et al., 2005) should be expanded to encompass the central role of water for all production, not just food, as well as life security and society overall.

While water ubiquity means that water is everywhere and universally relevant to all forms of life as well as other processes, *Water Centrality* means that humans would accept the notion of water ubiquity, recognise water for its unique importance for life and all related processes, which form the basis for society and economy, and make it the basis and priority for management and decision-making. Healthy water cycles would be the centre of concern and water would not be seen as a resource but a substance of central value to the planet, all life, society and everything humans do and aspire to.

Acknowledging the pervasive and central roles of water in our lives and livelihoods requires heightened awareness about water and its roles. People need to be educated (Falkenmark & the Symposium Scientific Programme Committee, 2005). It is perhaps not surprising that water used to be revered for its special powers, not only

because of prevalent superstitions and limited scientific knowledge in the past that led to a fascination with this ubiquitous, strange liquid (Marrin, 2002), but also because people were perhaps more personally, and spiritually, connected to water and had more appreciation of its importance. While this more intimate connection to water may have been associated with a less scientific knowledge base, water was also not as readily accessible as it is today (at least in the Western world). It is easy to forget the value of water when it is delivered to the tap at all times.

People have an innate connection with nature (Kellert, 2005; Wilson, 1993), which seems to be often overlooked or neglected in modern society, therefore, making water the lynchpin of society could be a way of emphasising or reinforcing this connection with nature and our utter dependence on it. Water as the link between nature and humans could help make people aware of those wide-ranging interconnections and of the importance of looking after the environment that supports us. This would also neatly tie in with health, which also depends very much on sufficient and clean water.

Despite our much more advanced science today, there are still large gaps in our knowledge about water (Ball, 2001; Donchev et al., 2006; Marrin, 2002). In addition to some fundamental bio-chemical and physical knowledge gaps, the physiological as well as psychological effects of water are only just beginning to be understood in science and in the awareness of the general public. However, enough is known about water to endorse an attitude of care, respect and wonder that should be fostered.

Water Centrality education could be delivered via the curricula of educational institutions but also through water literacy initiatives for the broader community as well as for decision makers in private and public capacities. Initiatives such as the collection of water knowledge and achievements in WM in Australia in *Water Innovation: A New Era for Australia* (Bowmer, 2004b) and the Water*mark* project aimed at improving water literacy (Victorian Women's Trust, 2007) are useful examples. Such education should not only teach but also place great emphasis on the 'activation' of existing knowledge in the community that is often neglected or disregarded, thereby informing, enriching and supporting any educational effort. Indeed, *Water Centrality* would require the active participation and input of as many people as possible in order to increase the communal knowledge about water, which would be an important element in effecting behavioural change, change in values orientation and the broadening of limited worldviews.

Education would have a crucial role to play not only through the direct effects this can have on increasing awareness and respect for water followed by more efficient water use, but also on such issues as population control, which is one of the biggest issues affecting water resources in many developing countries (Thatte, 2005). Other aspects that can influence population growth are gender equity and poverty reduction (Thatte, 2005), which are also connected to education and, obviously, to water. While provision of education, gender equity and poverty reduction alone can have positive effects on population growth, accessing these elements through *Water Centrality* could have the added advantage of supporting the water system rather than adding strain on it.

Educational activities could incorporate learning *from* water, its nature, flow, interconnection, inclusiveness, adaptability, etc. which could then be used and applied to institutional structures and processes. Water could also be a role model and teacher for much-needed education in continuity, adaptiveness and connectivity that seems critical across society, not only for integrative institutions. Ultimately, as a society and as individuals, we would need to internalise water, become aware of the already existing internalisation of water, and of 'being' water; gaining 'water literacy' akin to the 'ecoliteracy' sought by environmental educators (Centre for Ecoliteracy, 2000). It may also be a matter of 'relearning' or allowing to surface some of the more intuitive knowledge humans (used to) have about water (Marrin, 2007). It is our life already, in a biophysical sense, and it is conceivable that we could find our spiritual fulfilment and happiness in water.

In short, if *Water Centrality* were accepted, water 'management' in its current form would become a thing of the past; it would be a matter of course to consider water in all areas of life and living the embeddedness of water. Before such far-reaching societal changes could, and should, be initiated, some important questions should be considered: would such a worldview with all its consequences be feasible and practical or even desirable? And if so, how could these changes be achieved? Are we, or to what extent are we, a water central society already? What would need to be changed or adapted – the whole of society or just certain aspects of it, and which?

Clearly, these questions will require more than a single dissertation to answer but it is possible to make some suggestions. While ideas for the implementation of *Water Centrality* are sketched in Chapter 9, the outlined broad 'vision' of what a water society could look like may be able to assist in identifying required changes, associated

barriers and opportunities within the present situation. This vision can also form the basis for the identification of principles that are at the heart of *Water Centrality*, which, in turn, can be used as a guide for assessing existing structures, processes, instruments and tools to facilitate the transition to a water society. Ultimately, the desirability of such a society would have to be decided in a collective forum beyond this thesis.

5.4 *Water Centrality* Principles

What are the principles on which a society would have to base its decisions and institutions, as well as the approaches and methods used, in order to achieve *Water Centrality*? The basic answer would have to be that the priority must be a healthy water system as well as fair and equitable access to water for all. This means ensuring that water flows freely, remains clean and fresh and that aquifers are replenished, in short, that water cycles are functional and 'healthy'. All life forms should have access to sufficient water for survival, and be able to complete their life cycles, while ecosystems and resource cycles also should be kept healthy and functional so they can fulfil their roles in water cycling, cleansing and in numerous other ways.

It would also mean that the values of water are protected, including water for basic needs and livelihoods, water for recreational, aesthetic, spiritual and other social needs (see Chapter 2), and that fair and equitable access to water is provided for current and future generations as well as non-human life forms. All decisions and actions should ensure that the tenet of making water the central concern of society and giving it priority in decision-making to ensure healthy water cycles, is observed at all times.

This entails:

- viable and healthy water cycles – in air and soil, vegetation and animals (including humans) (= the living layer), as well as underground;
- adequate functionality of water and water assets - quality and quantity, form, vapour and flow;
- equity and fairness - equitable access to water, right to water for all life, now and in the future;
- the creation and proper function of appropriate institutions and processes that make water a priority; and
- increased and proper respect, awareness and knowledge as well as appropriate lifestyle and spirituality with regard to water.

5.4.1 Derivation of the Water Centrality Principles

Since *Water Centrality* is following on from, and builds on, sustainability and integration, and essentially aims to rearrange governance around water, it seems logical to expand on work already done. While the shortcomings of sustainability and integration have been outlined earlier it seems both logical and advantageous to utilise the broad support enjoyed by these ideas as well as the substantial work done in these areas.

The literature has been scanned for suitable publications, and the principles for the derivation of the *Water Centrality* Principles (WCP) were chosen because they resulted from extensive deliberation, have been endorsed by many people and cover the spectrum of areas that are considered relevant to *Water Centrality*. The *Bellagio Principles for Sustainability Assessment* (Hardi & Zdan, 1997) seem the obvious candidate to cover sustainability concerns, while the *Principles of Good Governance for Development* by the United Nations Development Programme (UNDP, 1997) and the associated *UNESCO Criteria for Effective Water Governance* (UNESCO World Water Assessment Programme, 2003) seem to be well established and have broad support in governance, which is required if *Water Centrality* is to be realised. No separate principles for integration were found but it was realised that many relevant aspects of integration were already contained in the *Bellagio Principles* as well as in the governance documents. Any further shortcomings with regard to integration could be addressed while adjusting the existing principles to form the *Water Centrality* Principles.

The *Bellagio Principles for Sustainability Assessment* reflect many of the issues described above (section 5.4). They are "offered in the belief that seeing differently is the first step to doing differently" (Hardi & Zdan, 1997 p.9). Compiled as a guide to assess progress toward sustainable development as well as to ensure the continuity of such an assessment, the guidelines are interrelated and should be applied as a complete set (see Table 5.1 for details). They are intended for use in starting and improving assessment activities of community groups, non-government organisations, corporations, national and sub-national governments, and international institutions (Hardi & Zdan, 1997) and have been adopted by various organisations, namely in the water field by the sustainable water resources roundtable (USGS) but also by organisations in other areas, such as power utilities and city councils.

The *Principles of Good Governance for Development* compiled by the United Nations Development Programme (UNDP, 1997) seem a suitable guide for governance.

> Good governance has eight major characteristics. It is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of society. (UNESCAP, n.d.)

These governance principles have been revisited and reiterated in a number of documents and contexts. The UNESCO World Water Assessment Programme (2003) has adapted these principles to form the basis for the *UNESCO Criteria for Effective Water Governance*. They are considered "to be effective when there is equitable, environmentally sustainable and efficient use of water resources and its benefits" which "includes minimizing transaction costs and making the best use of a resource" (UNESCO World Water Assessment Programme, 2003 p.373).

Recommendations on governance in the 2nd WWAP report highlight a collaborative approach between civil society, the private and government sectors (UNESCO World Water Assessment Programme, 2006). Through wide participation and consensus-building, societies should aim at identifying those attributes and actions that are most relevant to them. In this regard, inclusive dialogues at national and local levels are important to identify the appropriate challenges and actions for a given context (UNESCO World Water Assessment Programme, 2003). "Water sector reform goes hand-in-hand with overall governance reform" (UNESCO World Water Assessment Programme, 2006 p.82).

The *Bellagio Principles* were devised for sustainability assessment therefore they do not fully reflect the whole water system and the values of water. Similarly, the *Criteria for Effective Water Governance*, while far-reaching and comprehensive, do not reflect the full interconnectedness of water as outlined in the values of water, and thus fall short of true integration. They also need strengthening with regard to consideration of the wellbeing of the whole water system and not just water for human use.

In Table 5.1, the three original documents, the *Bellagio Principles for Sustainability Assessment* (Hardi & Zdan, 1997), the *Principles of Good Governance for Development* (UNDP, 1997) and the *UNESCO Criteria for Effective Water Governance* (UNESCO World Water Assessment Programme, 2003) have been

compared and amalgamated to form the *Water Centrality* Principles (WCP). This was done by separating the different principles and rearranging them into 'themes' that were derived from the originals, distilling commonalities but also finding differences. These 'themes' or resulting principles were then rearranged so that fundamental underlying, conceptual elements were placed first, followed by the more instrumental, practical components. The resulting principles were then 'water centralised' by changing the focus to water and by including references to water and *Water Centrality* where applicable and appropriate (highlighted in blue italics in the fourth column).

There are a number of areas that appeared to be limited or in need of expansion, so some elements were added using other literature or previous findings of this thesis (highlighted in orange italics in the fourth column of Table 5.1). Some were basic, such as the ongoing search for knowledge or Ashby's law of requisite variety, whereas the element of community capacity (Chaskin, 2006; Department for Community Development, 2005b; SCN, 2003) has added a variety of considerations which seemed to augment the existing principles. These extra elements are surrounded by double lines.

Table 5.2: Derivation of the *Water Centrality* Principles (WCP)

(Note: *blue italics* denote changes specific to water; *orange italics* highlight additional elements)

UNDP Principles and UNDP text (1997)	**UNESCO Water Governance Principles (WWAP 2003)**	**Bellagio Principles for Sustainability Assessment (1997 p2-4)**	***Water Centrality Principles***
			Strategic Vision
Strategic vision – leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical, cultural and social complexities in which that perspective is grounded.		**1. GUIDING VISION AND GOALS** Assessment of progress toward sustainable development should: • be guided by a clear vision of sustainable development and goals that define that vision	There is a clear, broad and long-term vision that reflects the *centrality of water*, with goals or objectives that define that vision
Rule of Law – legal frameworks should be fair and enforced impartially, particularly the laws on human rights.	**Ethical considerations:** water governance has to be based on the ethical principles of the societies in which it functions, for example by respecting traditional water rights.		*Water Centrality* is an ethical approach reflecting the ethical principles of the societies in which it functions

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
Consensus orientation – good governance mediates differing interests to reach a broad consensus on what is in the best interest of the group and, where possible, on policies and procedures.			Broad consensus is aimed for with regard to the best interests of the group and, where possible, policies and procedures *to benefit the water system*
			Participation and Voice
Participation – all men and women should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their intention. Such broad participation is built on freedom of association and speech, as well as capacities to participate constructively.	**Participation:** all citizens, both men and women, should have a voice – directly or through intermediate organizations representing their interests – throughout processes of policy and decision-making. Broad participation hinges upon national and local governments following an inclusive approach.	**8. BROAD PARTICIPATION** Assessment of progress toward sustainable development should: • obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people - to ensure recognition of diverse and changing values • ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action	All affected and interested parties, including non-human interests *and water*, have a voice and are represented throughout processes of policy and decision making to ensure recognition of diverse and changing values
			Freedom of association and speech are ensured as well as capacities to participate constructively
			Decision makers are included to secure a firm link to adopted policies and resulting action *that benefit water*
			Equity and Fairness
Equity – all men and women have opportunities to improve or maintain their wellbeing.	**Equity:** all groups in society, both men and women, should have opportunities to improve their wellbeing.	**3. ESSENTIAL ELEMENTS** Assessment of progress toward sustainable development should: • consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights,	The ecological conditions *and central role of water* on which life depends are considered for equity amongst all life forms
			All groups in society as well as non-human life forms have opportunities to improve their wellbeing through *adequate access to water*

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
		and access to services, as appropriate • consider the ecological conditions on which life depends • consider economic development and other, non-market activities that contribute to human/social wellbeing	Equity and disparity within the current population and between present and future generations are addressed and *related to water* with regard to such issues as resource use, water quality, pollution, poverty, over-consumption, human rights and access to services as appropriate
			Integration and Coherency
	Integrative: water governance should enhance and promote integrated and holistic approaches.	**2. HOLISTIC PERSPECTIVE** Assessment of progress toward sustainable development should: • include a review of the whole system as well as its parts • consider the wellbeing of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts • consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms	There is a review of the whole system as well as its parts and their interactions *in which the central role of water is made explicit*
			The wellbeing of social, ecological and economic subsystems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts are considered, *outlining their relation to water and highlighting the role of water*
			Both the positive and negative consequences of human activity are considered, in a way that reflects the costs and benefits for human and ecological systems, in terms of monetary and non-monetary *values of water*
			Ecosystem services, economic development and other, non-market, activities that contribute to human/social wellbeing are considered *and related to water*

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
		4. ADEQUATE SCOPE Assessment of progress toward sustainable development should: • adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to needs of future generations as well as those current to short term decision-making • define the space of study large enough to include not only local but also long distance impacts on people and ecosystems • build on historic and current conditions to anticipate future conditions - where we want to go, where we could go	Time frames are appropriate to capture human, ecosystem and *water system (hydrological cycle)* time scales thus responding to needs of future generations as well as those current to short term decision-making
			Spatial scales are large enough to include not only local but also long distance impacts on people, ecosystems *and associated water systems*
			Historic and current conditions *(social, cultural and ecological aspects) of water systems* are considered when anticipating future conditions; where we could go
		5. PRACTICAL FOCUS Assessment of progress toward sustainable development should be based on: • an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria • a limited number of key issues for analysis • a limited number of indicators or indicator combinations to provide a clearer signal of progress • standardizing measurement wherever possible to permit comparison • comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate	An explicit set of categories or an organising framework that has *water as a central concern* is used that links vision and goals to indicators and assessment criteria *that relate to the water system*
			A limited number of key issues that are *related to water and Water Centrality* is used for analysis
			A limited number of indicators or indicator combinations is used to provide a clear signal of progress towards *Water Centrality*
			Measurements are standardised *and relate to water* wherever possible to permit comparison

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
			Indicator values are compared to *water system* targets, reference values, ranges, thresholds, or direction of trends, as appropriate
		7. EFFECTIVE COMMUNICATION • draw from indicators and other tools that are stimulating and serve to engage decision-makers	Information is drawn from indicators and other tools *related to water* that are stimulating and serve to engage decision makers
	Coherency: the increasing complexity of water resource issues, appropriate policies and actions must be taken into account so that they become coherent, consistent and easily understood.		The complexity of *water issues,* appropriate policies and actions are taken into account so that they become coherent, consistent and easily understood
			Ongoing Responsiveness and Efficiency
Responsiveness – institutions and processes try to serve all stakeholders.	**Responsiveness:** institutions and processes should serve all stakeholders and respond properly to changes in demand and preferences, or other new circumstances.		Institutions and processes serve all stakeholders, *including water,* and are responsive to change and uncertainty *paying particular attention to water*
		9. ONGOING ASSESSMENT Assessment of progress toward sustainable development should: • develop a capacity for repeated measurement to determine trends • be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently • adjust goals, frameworks, and indicators as new insights are gained • promote development of collective learning and feedback to decision-making	There is capacity for iterative, adaptive and repeated measurements to determine trends *emphasising effects on the water system*
			There is commitment to ongoing performance review and adjustment of goals, frameworks, processes and indicators in light of new insights *with emphasis on water*
			Feedback on decision-making is encouraged *with particular attention to water*
			Collective learning and its development is promoted *emphasising*

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
			and relating to water
			There is commitment to ongoing search for new, traditional and indigenous knowledge with emphasis on water
Effectiveness and efficiency – processes and institutions produce results that meet needs while making the best use of resources.			Decisions are made with the aim of achieving economic efficiency and ecological effectiveness *and a functional water system*
			Institutional and Community Capacity
		10. INSTITUTIONAL CAPACITY Continuity of assessing progress toward sustainable development should be assured by: • providing ongoing support in the decision-making process • providing institutional capacity for data collection, maintenance, and documentation • supporting development of local assessment capacity	Ongoing support is provided in the decision making process *highlighting water*
			Institutional capacity for data collection, maintenance and documentation as well as for auditing these is provided *emphasising water*
			There is commitment to ongoing institutional capacity building and modernisation/ renewal *with accent on water*
Dimensions of Community Capacity (Chaskin, 2006; Department for Community Development, 2005a; Goodman et al., 1998)**:** • participation and leadership; • skills (such as planning, coordination, advocacy, management, problem solving, and conflict resolution) and knowledge; • resources (both access to resources, such as financial capital, social capital and technology, and the ability to use them prudently); • social and inter-organisational networks, social health & community cohesion; • self esteem, confidence, self-reliance and decision-making power • sense of community (belonging, influence, fulfilment of needs and emotional connection, social contact & mutual support); • understanding of community history; • community power (amalgamation of sense of community, leadership, resources and a shared concern); • community values (ability to define a shared value orientation and how consensus of these values is achieved); and • critical reflection.			Community capacity building is supported *enabled, and facilitated with particular concern for water*
Ashby's Law of Requisite Variety says that "only variety can absorb variety" (e.g. quoted in Kravchuk & Schack, 1996), hence institutions need processes and structures that can deal with variety and change adequately			*Institutions need to be able to deal with all forms of water*

UNDP Principles and UNDP text (1997)	UNESCO Water Governance Principles (WWAP 2003)	Bellagio Principles for Sustainability Assessment (1997 p2-4)	*Water Centrality Principles*
			Transparency, Accessibility and Accountability
Transparency – transparency is built on the free flow of information. Processes, institutions and information are directly accessible to those concerned with them, and enough information is provided to understand and monitor them.		**6. OPENNESS** Assessment of progress toward sustainable development should: • make the methods and data that are used accessible to all • make explicit all judgements, assumptions, and uncertainties in data and interpretations	There is free information flow and diffusion within a society *accenting water*
			Processes, institutions, information, methods and data are accessible to all
			Processes and decisions *take water into account* and are transparent and open for public scrutiny
			Judgements, assumptions and uncertainties in data and interpretations are made explicit *highlighting what this means for water*
		7. EFFECTIVE COMMUNICATION Assessment of progress toward sustainable development should: • be designed to address the needs of the audience and set of users • aim, from the outset, for simplicity in structure and use of clear and plain language	Documents, processes and institutions are designed to and address the needs of the audience and sets of users *as well as water*
			Simplicity in structure and use of clear and plain language*, featuring water,* are aimed for from the outset
Accountability – decision-makers in government, the private sector and civil society organizations are accountable to the public, as well as to institutional stakeholders. This accountability differs depending on the organizations and whether the decision is internal or external.	**Accountability:** governments, the private sector and civil society organizations should be accountable to the public or the interests they are representing.		Government, private sector and civil society organisations are accountable to the public and the interests they represent *including the water system*
		10. INSTITUTIONAL CAPACITY • clearly assigning responsibility	Responsibilities are clearly assigned *with accent on water*

The WCP can be used as a basis for the design and assessment of all types of projects, processes, decisions and other societal and private activities to ensure that water is made a central concern and *Water Centrality* outcomes are achieved. It is acknowledged that they cannot stand alone, but eventually need to be tied in with appropriate supporting processes, institutional and other structures as well as management approaches and tools. By necessity, the WCP cater for humans and their needs, but since they have water at their centre and include environmental and ecological considerations they are also valid for all other life forms as well as non-living elements; they could be termed 'aquacentric' or 'watercentric' instead of 'anthropocentric' or 'ecocentric'.

The WCP are also open for interpretation since flexibility is important in addressing situations that require different approaches and solutions, provided these interpretations or changes fit the overall mandate to make water the centre of concern and decision-making.

As outlined above, in order for these principles to be put into practice it requires first of all, the insight that this is necessary and then, the political will to make the appropriate changes. Since these adjustments are broad and affect the whole of society at all levels comprehensive support is needed. Importantly, awareness raising and education will be required but also other measures and initiatives (see Chapter 8 for details). While a fundamental transformation such as that proposed will need time, there is no time to lose and the WCP are ready to help facilitate some changes and raise awareness of the shortcomings of existing approaches and policies right now.

Chapter 6

Application of the *Water Centrality* Principles

6.1 Introduction

The *Water Centrality* Principles (WCP) are designed so that they can apply to all areas of life and society. It is envisaged that the principles will be used in a variety of ways, both on the route to a water society and when it has been established. The first role or function is that of a map or depiction of what a water society would look like with regard to structure (heuristic) and how its members would behave, based on *Water Centrality* norms (values base). Another important role will be as a guide (substantive policy) to ensure that new developments in any area of society are water central, which is also a type of *ex ante* evaluation. Both these uses pertain to policy, legislation, regulation, planning, project design and decision-making in all areas of government, business and the wider society with potentially far-reaching effects in terms of norms and beliefs (although it can be argued that beliefs have to change first before people will change).

A further use may be in the evaluation of existing policies, legislation, programmes, plans and other initiatives, a form of *ex post* evaluation, to determine their level of *Water Centrality* compliance and to decide whether they need to be changed and to what extent, or replaced and in what way. The WCP can also be used in auditing and evaluation of outcomes after the new policies, processes and plans have been put in place, as well as in monitoring.

One of the conditions which need to be fulfilled for evaluation to take place is the establishment of a baseline against which evaluations can occur, e.g. a desirable state or status, and another is a suitable process or method to facilitate this comparison.

The aims of this chapter are:

- to provide the theoretical background and rationale for a checklist instrument;
- to introduce the *Water Centrality* Instrument (WCI); and
- to suggest and examine potential uses of such a guide and decision aid.

6.2 Translating the *Water Centrality* Principles into Practice

The *Water Centrality* Principles can be considered as an expression of the values base of a society that has water as a central concern[26]. Such a clarified values base can have many advantages and functions. First, it represents the foundations on which a culture is built (see Chapter 5) and, secondly, it can serve as a guide for behaviour and conduct as well as a guideline for policy, process and institutional design (Begley & Boyd, 2000; OECD, 2002).

In addition, "values are essential antecedents to evaluation, since they help specify needs and problems and constitute a starting point in the evaluative process" (Zube, 1984 p. 3). Hence, the WCP are suitable as a base for evaluation and can be directly translated into an instrument, such as a checklist in which additional 'guideline statements' can be incorporated to reduce ambiguities, specify elements of interest and facilitate application (Begley & Boyd, 2000).

A values-based checklist so constructed can then guide the formulation of new policy (Begley & Boyd, 2000) but can also be used in the evaluation of existing policies, systems, programmes, institutions, processes, etc. (e.g. Stufflebeam, 2002) or alignment and integration of policy across government institutions (OECD, 2002). Further discussion about these uses is provided in section 6.3.

6.2.1 The Checklist Approach

The checklist approach has been used in applications as varied as environmental impact assessment, construction safety auditing, proficiency testing of dental surgeons and diagnosis of brain death, to name only a few. It is also the most widely adopted tool in local level sustainability assessment, at least in Europe (Devuyst, 2000). A checklist is also the basis of gender analysis, which is used in Western Australia "to reshape services, programs, policies, laws and organisational structures to ensure that women and men benefit equally" (Office of Women's Policy, 2005 p.12).

The advantages of a checklist lie in its provision of specific feedback as well as global assessment (Evans, 2001), and a checklist can ensure that all important aspects are considered and none is overlooked (Booth & Brice, 2004), while checklisting can help with the identification of impacts (*Impacts of Sprawl on Monroe County*, 2000) or

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[26] It is recognised that the WCP are a suggestion and do not represent the existing values of a society. In order to 'validate' the WCP and 'clarify' their values base, public debate is essential (see Chapter 8).

potential problems (e.g. *Environmental Management Checklist*, n.d.) and with providing guidance for activities, funding approval and implementation (e.g. The North East of England European Partnership, 2000). It can also be used as an element in the mainstreaming of a particular issue or aspect such as gender awareness (Office of Women's Policy, 2005).

> The advantages of checklists are that they allow for concise summarisation of impacts and promote the conceptualisation of a host of effects that may occur due to a human-induced action. The disadvantages are that they may be incomplete or too general; do not allow for interactions between effects; allow for the possibility of double counting of effects; identification is qualitative and subjective; and do not allow for the listing of the probability or likelihood of occurrence. (*Impacts of Sprawl on Monroe County*, 2000)

Recognised disadvantages of checklists can be that they are restrictive, can be incomplete or may force an inaccurate result due to their scope and content (Sturges & Griffin, 2003). In environmental assessments they have been regarded as "a mechanistic and trivial form of assessment" (Brown, 1997 p.76) that can result in little more than bureaucratic compliance without real contribution to programme formulation. Checklists may also be superficial, in that when 'a box gets ticked' in a checklist this does not indicate *how* a particular issue is addressed, which can lead to unsatisfactory outcomes. They can also contribute to an impression, which can be misplaced, that the matter being assessed is actually being attended to (Brown, 1997).

Clearly, there has to be a distinction between assessment and follow-up action or implementation; assessment cannot replace implementation but is a precursor and can provide guidance. It seems logical that, as with any tool, evaluative tools including checklists are tailored to the specific use (and users) in order to get specific and valid results and also to reduce subjectivity which increases with broader coverage (Cooke 1999 cited in Sturges & Griffin, 2003).

Checklists can be simple (e.g. 'tick a box') or more elaborate, allowing for ratings (either qualitative or quantitative). These include matrices which are essentially two-dimensional checklists that have an interval, ordinal, ratio or nominal scale assigned to each impact, adding to the existing advantages and disadvantages of checklists, in that it is more time consuming and more difficult to conceptualise (*Impacts of Sprawl on Monroe County*, 2000).

Some of the criticism of checklists is grave but some of the advantages are also compelling. The conclusion that can be drawn is that checklists should be used only in appropriate circumstances and situations; they should be designed carefully; and caution should be exercised in using and/or applying checklists.

In the present case, a checklist approach was deemed appropriate since the *Water Centrality* Principles already provide a suitable values-base in list form that can be converted into a checklist with little difficulty. Given the great complexity of water issues and the broad scope of *Water Centrality* this approach seems warranted, providing an aid that ensures that all main aspects and issues are considered and addressed. The mainstreaming potential of such an instrument also seems valuable in the case of water.

While not all disadvantages of checklists can be eliminated, the design of the proposed *Water Centrality* Instrument (WCI) checklist should ensure that much thought is given to *how* identified shortcomings can be addressed. Clearly, issues with lack of action and implementation need to be taken care of through other mechanisms that follow on from the initial assessment (see Chapter 8). The proposed checklist can be useful in a variety of applications that are outlined in section 6.3, but first, the actual *Water Centrality* Instrument is introduced.

6.2.2 The Water Centrality *Instrument (WCI)*

The *Water Centrality* Instrument (WCI) is a values-based checklist that is directly derived from the *Water Centrality* Principles (WCP). Practical applications using a checklist require the principles to be in a specific and functional form so they have been translated into questions (Table 6.1), which are numbered for ease of (cross-) referencing. The instrument also provides 'expectations' for each point that explain what the assessed item needs to provide in order to be *Water Centrality* compliant. These explanations are designed to reduce ambiguity and are intended to provide guidance during the application of the instrument.

The WCI, and all its contents, is regarded as a first suggestion and a work in progress. Hence, it is possible, and expected as a matter of course in a (future) water society, that changes or improvements would be made to the instrument provided that these are in keeping with the spirit of *Water Centrality*, concur with the seven principles (or their revised counterparts) and have the values of water as their base. Particularly,

the expectations could be adjusted, e.g. in light of new information, while some of the points and sub-points could be ordered differently, depending on emphases or priorities.

It can be envisaged that smaller or more concise forms of the instrument will be designed for use in 'quick assessments' (for an example see the '*Waterbookmark*' provided with this thesis) or that a subsection of the principles or the instrument is adapted for specific uses. Here, again, caution needs to be exercised so that the WCP are not distorted or diluted beyond acceptability.

Table 6.1: *Water Centrality* Instrument (WCI) based on the *Water Centrality* Principles (see Chapter 5 and Table 5.2)

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
1		**Strategic Vision**		
1.1	a.	There is a clear, broad and long-term vision that reflects the centrality of water, with goals or objectives that define that vision	Is there a clear, broad and long-term vision?	*The vision is a statement of the overall aim. A succinct formulation should capture in easy to understand and broad terms what is to be achieved in the long run. It should inspire by being sensible and credible, sound and well-reasoned as well as emotionally appealing and vividly presented.*
	b.		Does this vision reflect the centrality of water for life?	*The central role of water is taken into account and acknowledged in the vision. The centrality of water refers to its absolute importance for life and overall system function.*
	c.		Is the vision defined by goals or objectives that also reflect the centrality of water for life?	*The goals define the vision in a more tangible and detailed way and show the importance and centrality of water, i.e. the connection water has with all aspects of life.*
1.2	a.	*Water Centrality* is an ethical approach reflecting the ethical principles of the societies in which it functions	Are ethical principles made explicit that may be represented by traditional water rights, human rights and indigenous lore of relevant societies?	*Ethical principles such as those represented by human rights, including the right to water, should be ensured. Traditional water rights may be taken into consideration if they represent ethical principles. Traditions and lore may need to be reviewed for their ethicality, e.g. inequitable distribution of water may not be acceptable even if it is a traditional right. This would best be embedded in a* Water Centrality *Charter.*

		Water Centrality Principles	Water Centrality Questions	Expectations
1.3	a.	Broad consensus is aimed for with regard to the best interests of the group and, where possible, policies and procedures to benefit the water system	Is broad consensus aimed for with regard to the best interest of the group and, where possible, policies and procedures to benefit the water system?	*Broad consensus[27] is more than a majority rule or decision; it means to achieve broad agreement, a common base through negotiation and conflict management to ensure acceptance of outcomes and enable implementation. This requires participation of all relevant stakeholders and decision makers (see also 2.1) and aims for the 'wellbeing' of the water system.*
2		**Participation and Voice**		
2.1	a.	All affected and interested parties, including non-human interests and water, have a voice and are represented throughout processes of policy and decision making to ensure recognition of diverse and changing values	Are affected and interested parties, including non-human interests and water, represented and do they have a voice throughout processes of policy and decision making?	*It is not sufficient to state that all relevant stakeholders are included. Explicit listing of stakeholders (including women, youth, indigenous people and non-human life forms) would be useful in most cases. Representation of non-human life forms as well as water should be ensured through advocacy.*
	b.		Is recognition of diverse and changing values ensured through this?	*Consideration of all values should be ensured through appropriate processes (see also 2.1.1.b). Changes over time need to be dealt with on an ongoing basis (see also 5).*
2.1.1	a.	Freedom of association and speech are ensured as well as capacities to participate constructively	Are freedom of association and speech assured?	*These are basic human rights without which full participation cannot occur. The UDHR[28] affirms the right to free speech so does the ICCPR[29]. Australia is a signatory to both but has not enshrined free speech into legislation and hence it is not enforceable in court, while freedom of association was mainly granted with regard to unions in Australia. The situation may require attention since these rights are not automatically ensured and should be officially enshrined in some form as well as being enforced.*

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[27] The WCI is an organising tool that by itself cannot achieve consensus; conflict management, not conflict resolution, should be used to harness the creative potential of conflict and tension (see e.g. Dietz et al., 2003) and reach a common accord or basis from which to proceed that does not imply uniform opinions or total agreement

[28] Universal Declaration of Human Rights (UDHR), Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

[29] Article 19(2) of the United Nations International Covenant on Civil and Political Rights (ICCPR) (1966) states that: Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice. The ICCPR forms Schedule 2 of the Human Rights and Equal Opportunity Commission Act 1986 (Commonwealth).

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
				Arguably, a form of participative democracy would best suit Water Centrality *to enable fuller participation overall.*
	b.		Are capacities to participate constructively ensured?	*Constructive participation is based on accessibility, openness and fairness (see also 5 and 6) but also should ensure that participatory processes are tailored to the participants so they are not disadvantaged because of gender, ethnicity, age, economic or literacy status or other potential impediments (see also 7).*
2.1.2	a.	Decision makers are included to secure a firm link to adopted policies and resulting action that benefit water	Is the participation of decision makers ensured to secure a firm link to adopted policies and resulting action that benefit water?	*Decision makers are stakeholders who need to be included from the start, preferably in the planning stages, so that coherency and implementation are ensured to the benefit of water.*
3		**Equity and Fairness**		
3.1	a.	The ecological conditions and central role of water on which life depends are considered for equity amongst all life forms	Are the ecological conditions and the central role of water on which life depends considered for equity amongst all life forms?	*Changes in ecological conditions can have far-reaching consequences and need to be identified so they can be addressed. In this, all life forms, including humans, need to be treated equitably due to interdependence.*
	b.		Is the central role of water for those ecological conditions considered?	*Without water there is no life, so water availability is central to all ecosystems and life forms as well as their functions. This should be acknowledged clearly.*
3.1.1	a.	All groups in society as well as non-human life forms have opportunities to improve their wellbeing through adequate access to water	Do all groups in society as well as non-human life forms have adequate access to water to ensure opportunities to improve their wellbeing?	*Adequate access to water is the basis for existence and wellbeing for all life forms, human and non-human. Hence, existing ecosystems and human populations need to have at minimum sufficient water for survival. Humans are part of the ecosystem and rely on healthy ecosystem function hence this function needs to be ensured while human needs also have to be covered beyond mere survival (see Chapter 2). Decisions should be based on information and knowledge and human influences have to be balanced accordingly.*

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
3.1.2	a.	Equity and disparity within the current population and between present and future generations are addressed and related to water with regard to such issues as resource use, water quality, pollution, poverty, over-consumption, human rights and access to services as appropriate	Are intra- and inter-generational equity and disparity considered in terms of resource use and access, water quality, pollution, poverty, over-consumption, human rights and access to services?	*Equity is essential for* Water Centrality. *All people should have equal rights and obligations as well as equal opportunity to the listed issues, as a minimum[30]. The needs of future generations must be considered as well as the needs of the people currently alive. Considerations need to include equity between regions, e.g. in inter-basin water transfers.*
	b.		Are these considerations in 3.1.2.a related to water?	*Water is essential to or interacts with most of these considerations (see 3.1.2.a) and hence these relationships need to be explored appropriately.*
4		**Integration and Coherency**		
4.1	a.	There is a review of the whole system as well as its parts and their interactions in which the central role of water is made explicit	Is there a review of the whole system as well as its parts?	*A review of an entire system may be difficult and complex, depending on the system in question, but has to take place at some stage (rather sooner than later). Systems can be encapsulated within other systems and different scales may need to be considered depending on the situation.* *It would be useful to do a review of the whole water system and all water cycles showing interconnections as well as direct and indirect effects, so that this can be referred to in reviews of lower scale systems and used to place these systems into context (in a nested approach) since a subsystem cannot stand alone. A conceptual model of the system in question showing all the connections to water should be produced. Such a review requires a participatory approach, such as mapping exercises and others. Methodologies such as input-output analysis of water use (Lenzen & Foran, 2001) may be useful. The values of water (Chapter 2) may be a starting point and rough guide.*
	b.		Is the central role of water being made explicit in the system and its parts?	*This is paramount since water is the source of life. It includes direct as well as indirect roles of water. The whole water system review should serve to make the central role of water explicit, with quantitative as well as qualitative*

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[30] Rawls (1971) argues that if there is to be liberty of opportunity, then opportunity must exist for all in every institution. If water doctrines do not promote equality of liberty of opportunity in access to water, then the liberties of the whole society are reduced. (Tisdell, 2003 p.403)

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
				aspects (values of water, input-output analysis (e.g. Lenzen & Foran, 2001)).
	c.		Are the implications and potential impacts for all water cycles considered?	*These include the local, regional and global water cycles as well as those above ground and underground in liquid, vapour and solid (ice) form, taking into consideration living and non-living elements. The virtual water cycle may also need to be considered.*
	d.		Are the connections and interdependencies of water considered?	*Since water is central to life its connections and interdependencies need to be explored fully.* *The review of the water system should show this. A form of input-output analysis may be useful.*
	e.		Is sufficient knowledge available about the system and its parts? If not, are provisions made to address this?	*This has to be determined on a case by case basis.* *If insufficient knowledge is available efforts should be made to remedy this (see also 6.3, 6.7, 7.3 and 7.4).* *In the meantime the precautionary principle should be adopted.* *Review and update regularly.*
4.1.1	a.	The wellbeing of social, ecological and economic subsystems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts are considered, outlining their relation to water and highlighting the role of water	Is the wellbeing, its state as well as the direction and rate of change, of the ecological subsystem and its component parts considered with regard to water?	*The ecological subsystem* comprises all living things and the cycles they rely on as well as the role water plays in these. Although humans are part of this subsystem they are considered separately in the social subsystem (4.1.1.b) due to the extensive influence we have on the water system.* **It seems useful to explore the subsystems separately and in detail to facilitate better understanding, but it is important to take note of any interconnections with other subsystems so they can be taken into account (in 4.1.1.d). Trends need to be identified in order to anticipate change and prioritise actions. It may be useful to have a generic conceptual model of the system in question to guide exploration (the review of 4.1 could be a useful guide).*
	b.		Is the wellbeing, its state as well as the direction and rate of change, of the social subsystem and its component parts considered with regard to water?	*The social subsystem refers to human endeavours, activities and institutions and the cycles they rely on as well as those that depend on human interaction (see also Chapter 2).* *Those concerns directly to do with physical survival are not strictly social but are included for the sake of simplicity. (See also* at 4.1.1)*

		Water Centrality Principles	Water Centrality Questions	Expectations
	c.		Is the wellbeing, its state as well as the direction and rate of change, of the economic subsystem and its component parts considered with regard to water?	*The economic subsystem is arguably a subsystem of the social (or human) system but since economics appears to be of great importance to humans it is dealt with separately. This subsystem relates to the production, distribution and trade of goods and wealth and needs to be related to water. (See * at 4.1.1)*
	d.		Are the wellbeing, the state as well as the direction and rate of change, of the interactions of the subsystems and their component parts being considered with regard to water?	*All three subsystems interact and therefore it is an important if complex (and often neglected) task to fully explore the interactions of all subsystems to detect trends, opportunities and threats that arise from these interactions.*
4.1.2	a.	Both the positive and negative consequences of human activity are considered, in a way that reflects the costs and benefits for human and ecological systems, in terms of monetary and non-monetary values of water	Are the positive and negative outcomes of human activities identified as monetary and non-monetary values of water (= ecosystem services of water), so that the costs and benefits to human and ecological systems are reflected?	*In all three subsystems both monetary and non-monetary values exist (are assigned by humans). All of them are important for a fuller picture of the outcomes of human activities, positive and negative, for both humans and ecological systems (since without functioning ecosystems human endeavours are impossible).*
4.1.3	a.	Ecosystem services, economic development and other, non-market, activities that contribute to human/social wellbeing are considered and related to water	Are the ecosystem services of water fully considered?	*This needs to be done with regard to direct and indirect ecosystem services such as regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment, 2005). All these services depend on water or are connected to it (see also Chapter 3.2).*
	b.		Are the economic activities that contribute to human/social wellbeing considered with regard to water?	*This is a more detailed look at the monetary values, as well as trade and commerce activities related to water in terms of their contribution to human wellbeing (could be part of 4.2.1.c and 4.2.3.b).*
	c.		Are the non-market activities that contribute to	*A more detailed look at non-monetary values that contribute to human wellbeing and their relationship with*

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
			human/ social wellbeing considered with regard to water?	*water (could be part of 4.2.1.b, 4.2.2.a and 4.2.3.b).*
	d.		Are the interactions of the ecosystem services of water as well as their economic and non-market values considered?	*The interactions of the ecosystem services outlined in 4.2.3.a-c can oppose or negate each other and should be fully explored to anticipate or prevent serious implications for human and ecosystem wellbeing.*
	e.		Are all these elements considered in a local, regional, national and global context?	*All these elements (4.2.3.a to 4.2.3.d) need to be considered with regard to these levels to ascertain their influences and extent and how they are best approached or solved. These contexts may overlap or be discrete but it is likely that more than one level will apply and cross-scale influences will need to be considered (see e.g. Dietz et al., 2003).*
4.1.4	a.	Time frames are appropriate to capture human, ecosystem and water system (hydrological cycle) time scales thus responding to needs of future generations as well as those current to short term decision-making	Are the time frames long enough to capture all water system (hydrological cycle) time scales?	*This depends on the water system(s) that are affected and varies with the nature of the assessed item and the spatial scale. However, all water systems and cycles are interdependent, which needs to be realised and acknowledged.* *Since it is not practical to do a full assessment of all water cycles in all systems in all cases, a full inventory of water cycles and their interactions should be available elsewhere for reference.*
	b.		Are time scales appropriate to cater for future generations?	*This implies multiples of a human generation length (~25yrs).*
	c.		Are time scales appropriate for current short-term decision making?	*Should be suitable for the case in question and may include election or review cycles.*
4.1.5	a.	Spatial scales are large enough to include not only local but also long distance impacts on people, ecosystems and associated water systems	Is the spatial frame of reference sufficiently large to include both local and long distance impacts on water systems?	*Long distance and cross-scale influences (atmospheric, groundwater, rivers) can have great importance on local conditions and vice versa. Even if the assessment is for a small area the broader picture needs to be captured so that these influences can be ascertained (see also 4.2.3e).*
4.1.6	a.	Historic and current conditions (social, cultural and ecological	Are historic considerations included in anticipating future	*Includes traditional, cultural, ecological, spiritual, legal, commercial, political and administrative heritage and their relationships to water. Their influence*

		Water Centrality Principles	Water Centrality Questions	Expectations
		aspects) of water systems are considered when anticipating future conditions - where we could go	conditions of water?	*may be past or ongoing but all need to be considered for potential effect of the future of water systems.*
	b.		Are current conditions of water systems considered in anticipating future conditions?	*The current state of the water system, in terms of water availability, quality, hydrogeology, ecology as well as allocation status, can determine future outcomes and needs to be documented and assessed, also as a reference point.*
	c.		Where could we go? Are all possibilities and alternatives considered?	*All scenarios and possibilities, including the 'no change' option and utopian ones, can be informative and inspiring and need to be explored to ensure that fully informed decisions are made.*
4.1.7	a.	An explicit set of categories or an organising framework that has water as a central concern is used that links vision and goals to indicators and assessment criteria that relate to the water system	Is an explicit set of categories or an organising framework employed that links vision and goals to indicators and assessment criteria?	*A clear framework can help with identifying meaningful indicators and aid assessment (e.g. Peet & Bossel, 2000); this needs to be linked to the vision and goals to ensure that intended outcomes are achieved. Review framework and indicators regularly for appropriateness.*
	b.		Do the set of categories or the organising framework have water as a central concern and are the indicators and assessment criteria related to the water system?	*The framework has to ensure that water is made a central concern and the indicators or the assessment criteria need to be chosen accordingly. While this would include obviously water-related elements, given that water is relevant for most aspects of interest to humans, at least indirectly, many 'non-water' aspects could also be valid.*
4.1.7.1	a.	A limited number of key issues that are related to water and *Water Centrality* is used for analysis	Are a limited number of key issues used for analysis?	*A limited number of key issues help reduce complexity. Ensure that key issues are correct and applicable through an inclusive participatory process.*
	b.		Are these key issues related to water and *Water Centrality*?	*While most issues are related to water, at least indirectly, those that have the most obvious and relevant connections to the Water Centrality Principles should be chosen.*
4.1.7.2	a.	A limited number of indicators or indicator combinations is used to provide a clear signal of progress towards *Water Centrality*	Are a limited number of indicators or indicator combinations used that provide a clear sign of progress towards *Water Centrality*?	*Fewer indicators limit complexity, but they need to be relevant to what is assessed, in this case progress towards Water Centrality. A policy may not need to be descriptive in detail but should ensure guidance if subsequent processes or documents need to deal with this.*

		Water Centrality Principles	Water Centrality Questions	Expectations
4.1.7.3	a.	Measurements are standardised wherever possible to permit comparison and relate to water	Are measurements standardised wherever possible to allow comparison?	*Standardisation is usually not a problem for quantifiable measurements but can be more difficult for some qualitative data. Comparison is important for monitoring progress and trends.*
	b.		Do these measurements relate to water?	*Although most measurements can be related to water, at least indirectly, the most appropriate and relevant should be chosen.*
4.1.7.4	a.	Indicator values are compared to water system targets, reference values, ranges, thresholds, or direction of trends, as appropriate	Are indicator values compared to targets, reference values, ranges, thresholds or directions of trends, as appropriate?	*Comparison is paramount to assess progress and trends. Indicators can be quantitative or qualitative and include not only bio-physical and socio-economic but also political measures, e.g. policy and legislation. Performance targets should be complemented by information targets[31] to allow for ongoing evaluation and course corrections.*
	b.		Do these values relate to the water system?	*Indicator values as well as target values should be related to the water system as explicitly as possible.*
4.1.8	a.	Information is drawn from indicators and other tools related to water that are stimulating and serve to engage decision makers	Is information drawn from indicators and other tools that are stimulating and serve to engage decision-makers?	*Meaningful and relevant information is best, but may not be readily available and an ongoing search for information and knowledge is needed (see 5.2.1). Decision makers need to be interested to ensure ongoing involvement, commitment and appropriate decisions.*
	b.		Is this information related to water?	*All information derived from indicators and other tools should be related to water to show their connections, especially when these are indirect.*
4.2	a.	The complexity of water issues, appropriate policies and actions are taken into account so that they become coherent, consistent and easily understood	Are the increasing complexity of water issues, appropriate policies and actions taken into account so that they become coherent, consistent and easily understood?	*Increasing complexity of water issues, in terms of institutions, increased competition due to population growth, markets, etc., needs to be identified and documented or otherwise made explicit. Existing policies and actions need to be outlined and their relationship to each other as well as to the assessed items explained clearly. An understandable picture of the overall situation should be created that shows how all parts work together, identifying inconsistencies so they can be addressed. Findings from 4.1 form the basis for this.*

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[31] Information targets are indicator points that are set throughout a project to gauge progress that can include quantitative as well as qualitative information concerning targets but also players, processes and structures (see Westley et al., 2006).

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
5		**Ongoing Responsiveness and Efficiency**		
5.1	a.	Institutions and processes serve all stakeholders, including water, and are responsive to change and uncertainty paying particular attention to water	Do institutions and processes serve all stakeholders, including water?	*It is important that institutions and processes do not exclude any stakeholders either by design or inadvertence; they need to be inclusive (see also 2.1)ensuring that water is considered as a 'stakeholder' with reluctant parties also being identified and included as far as possible.*
	b.		Are institutions and processes responsive to change and uncertainty with particular attention to water?	*Ongoing monitoring and review needs to be ensured (through expertise, finances, administration, processes, etc.) and new insights and knowledge need to be incorporated on an ongoing basis to effectively deal with change and uncertainty (e.g. Pahl-Wostl, Sendzimir, Jeffrey et al., 2007) (see also 5.1.1 and 5.1.2). This needs to occur with particular attention to water in its direct and indirect guises, ensuring that no important issue is overlooked or under attended.*
5.1.1	a.	There is capacity for iterative, adaptive and repeated measurements to determine trends emphasising effects on the water system	Does the capacity exist to determine trends through measurements that are iterative, adaptive and repetitive?	*The capacity to undertake regular review and analysis of trends as well as making the necessary adaptations needs to be provided. This requires adequate human, financial and procedural resources.*
	b.		Do the measurements show the effects on the water system?	*Measurements should be made with their relevance to the water system in mind; highly relevant ones should be preferred if possible and appropriate, depending on the context; if the measures relate indirectly to water only this may be more difficult.*
5.1.2	a.	There is commitment to ongoing performance review and adjustment of goals, frameworks, processes and indicators in light of new insights with emphasis on water	Is there commitment to ongoing review of performance?	*Performance review is a standard process in a responsible institution or organisation. It makes review meaningful, especially if findings are translated into useful adaptation and change; this should occur with particular emphasis on water and* Water Centrality.
	b.		Are goals, frameworks, processes and indicators adjustable in light of new insights and emergence of traditional knowledge with	*New knowledge, particularly that related to water, needs to be distributed and incorporated where applicable so that changes can be made as appropriate. This has to be ongoing and enshrined in review processes.*

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
			emphasis on water?	
5.1.3	a.	Feedback on decision making is encouraged with particular attention to water	Is feedback on decision making encouraged with particular attention to water?	*Feedback ensures that problems with decisions are detected before they escalate. Changes can be made if appropriate and ultimately acceptability of decisions and outcomes to stakeholders can be increased. Particular attention should be on water.*
5.2	a.	Collective learning and its development is promoted emphasising and relating to water	Is collective learning and its development promoted?	*Collective learning is not only based on review but entails active seeking of new ways of doing and new and hidden or obscured knowledge (e.g. Pahl-Wostl, Sendzimir et al., 2007).*
	b.		Is collective learning emphasising and relating to water?	*Any learning should be related to and emphasise the connections to water to promote awareness of* Water Centrality *and water relationships.*
5.2.1	a.	There is commitment to ongoing search for new, traditional and indigenous knowledge with emphasis on water	Is there commitment to ongoing search for new, traditional and indigenous knowledge?	*The discovery of knowledge needs to be supported on an ongoing basis to ensure long-term increase of knowledge which allows for the best possible decisions to be made.*
	b.		Is the ongoing search for knowledge emphasising water?	*Water-related knowledge and the knowledge of water relationships are particularly pertinent to* Water Centrality *and should be fostered specifically.*
5.3	a.	Decisions are made with the aim of achieving economic efficiency, ecological effectiveness and a functional water system	Are decisions made with the aim of achieving economic efficiency, ecological effectiveness and a functional water system?	*It is important to meet the needs of stakeholders and users while making the best use of available resources (which are usually limited) and doing the least possible harm to the environment and the water system in the process.*
6		**Institutional and Community Capacity**		
6.1	a.	Ongoing support is provided in the decision making process highlighting water	Is ongoing support in the decision making process provided?	*Guidance for decision making should be provided to organisations and individuals as appropriate to ensure that well-informed, practical and reasonable decisions are made that suit the situation. Support also includes appropriate human and other resources and capacity.*
	b.		Is ongoing decision support highlighting water?	*Any decision support should ensure that water is considered, directly or indirectly, as appropriate.*
6.2	a.	Institutional capacity for data collection,	Is institutional capacity for data collection,	*Basic prerequisites such as facilities, training, human and financial resources as well as processes need to be available*

		Water Centrality Principles	Water Centrality Questions	Expectations
		maintenance and documentation as well as for auditing these is provided emphasising water	maintenance and documentation as well as for auditing these provided?	*on an ongoing basis (see also 6.3).*
	b.		Is institutional capacity for data collection, maintenance, documentation and auditing appropriate for water?	*Facilities, training, human and financial resources as well as processes need to be designed so that water issues are considered throughout and as appropriate for direct and indirect water issues.*
6.3	a.	There is commitment to ongoing institutional capacity building and modernisation/ renewal with accent on water	Is there commitment to ongoing institutional capacity building and modernisation or renewal?	*Mechanisms need to be in place that ensure ongoing review and renewal in the face of new information and knowledge but institutions also need to actively seek learning and progress to ensure that the needs of stakeholders and users are met on an ongoing basis. The principles of social learning may be usefully employed (e.g. Pahl-Wostl, Sendzimir et al., 2007).*
	b.		Is institutional capacity building and modernisation or renewal done with keeping water in mind?	*All capacity building and renewal or updates should occur in a manner that emphasises water and its central role as well as all its relationships, hence the mechanisms mentioned under 6.3.1 should cater for water and ensure that it is considered.*
6.4	a.	Community capacity building is supported enabled, and facilitated with particular concern for water	Is community capacity building enabled, supported and facilitated?	*Community capacity relates to informal or organised interactions of people and resources existing within a community that aid in problem solving, provide the basis to adapt to change and maintain wellbeing (Chaskin, 2006; Goodman et al., 1998). It is also called community development and refers to local empowerment and the ability of communities to help themselves, which depends on strong social cohesion and low incidence of social problems as well as development of self esteem, confidence, self-reliance and decision-making power (Department for Community Development, 2005a). Local initiatives need institutional and government support as well as resources, which include appropriate structures and processes (see also sections 2, 5, and 7) as well as those elements under 6.1-3 and 6.5. Social learning may also be useful in this context (e.g. Pahl-Wostl, Sendzimir et*
6.4.1	a.		*Community development* Is capacity for participation and leadership developed and fostered?	
	b.		Is skills development supported?	
	c.		Are resources provided (financial, social and technical) and is their prudent use ensured?	
	d.		Are social and inter-organisational networks fostered?	

		Water Centrality Principles	Water Centrality Questions	Expectations
	e.		Is the development of self-esteem, confidence, self-reliance and decision-making power supported?	*al., 2007).* *Water should be a central consideration in all these activities, highlighting the role of water in these and fostering (the awareness of) relationships with water.*
	f.		Is a sense of community promoted?	
	g.		Are all these efforts undertaken with water in mind or a focus on water?	
6.5	a.	Institutions need to be able to deal with all forms of water	Are institutions able to deal with all forms of water?	*Institutions are often set up to deal with blue (liquid) water or waste water or sewage but have limited capacity to deal with green water, grey water (household waste water except toilet waste), black water (toilet waste),water vapour or virtual water (indirect water transfer through produce trade). This is true for formal[32] as well as informal institutions. The complexities of interconnectivities between these forms of water also need to be addressed as appropriate.*
7		**Transparency, Accessibility and Accountability**		
7.1	a.	There is free information flow and diffusion within a society that accents water	Is information distributed freely within society?	*Information needs to be easily accessible and distributed actively throughout society, including to disadvantaged and less interested members. There need to be provisions and mechanisms for this to occur, e.g. good media exposure, distribution of written and other information, Internet presence.*
	b.		Is this information accenting water?	*The tenet of* Water Centrality *should be supported by emphasising water and its relationships wherever possible to increase water literacy; it should become a matter of course.*
7.1.1	a.	Processes, institutions, information, methods and data are accessible to all	Are processes, institutions, methods data and information available and accessible to all?	*Institutions need to be contactable and accessible, in person and via phone and electronic means as well as with regard to structure and processes. The latter should be transparent, appropriate and uncomplicated. Data, information and methods need to be freely available to all interested parties. They need to be understandable and in a format that is accessible to all stakeholders and useful*

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[32] Formal institutions are those set up in a formalised way, such as government departments, educational institutions or banks. Informal institutions are those that are not formally organised such as culturally based interest groups, although some of these, such as religious organisations, may also be formalised.

		Water Centrality Principles	*Water Centrality Questions*	*Expectations*
				for decision makers (e.g. Dietz et al., 2003). It also means that information needs to be available in different forms (e.g. print, radio, TV, and Internet) since not everyone can read or has a TV, buys a newspaper or has Internet access.
7.1.2	a.	Processes and decisions take water into account and are transparent and open for public scrutiny	Are all processes and decisions transparent and open to public scrutiny?	*It needs to be obvious and apparent which processes are applied, how they work and how they are used. It also needs to be clear how decisions are made and what the outcomes are. There need to be provisions for review and feedback (see also 5.1.3).*
	b.		Do all processes and decisions take water into account?	*Water needs to be considered in all processes and in each decision; this may be in the form of an extra clause or set of questions or, ideally, should be built in or even focus on water.*
7.1.3	a.	Judgements, assumptions and uncertainties in data and interpretations are made explicit highlighting what this means for water	Are all judgements, assumptions and uncertainties in data and interpretations being made explicit highlighting what this means for water?	*All judgements, assumptions and uncertainties need to be revealed to reduce surprises, hidden agendas and the potential for corruption. This needs to be considered with regard to 4.1- whole system review and should highlight the potential and actual effects on the water system.*
7.2	a.	Documents, processes and institutions are designed to address the needs of the audience and sets of users as well as water	Are documents, processes and institutions designed to address the needs of the audience and users?	*Documents produced by and processes used in all institutions need to be understandable and user friendly. They also need to be relevant and appropriate to the audience, the process or institution in question. The institutions themselves need to be accessible and relevant, avoiding duplication or unnecessary complexity.*
	b.		Are documents, processes and institutions designed to address the needs of water?	*Documents and processes should be well thought-out, relating to and emphasising the roles and values of water. The institutions themselves should be designed with water in mind; conceptually, water could be used as a role model to set up processes and other elements, e.g. information flows and data pools; physically, buildings and settings should cater for water through appropriate setting, architecture, building methods and materials, interior design, infrastructure, etc.*
7.2.1	a.	Simplicity in structure and use of clear and plain language, featuring	Is the structure simple and is clear and plain language used that features	*The structure of documents and processes should be uncomplicated and unambiguous to enable ease of reading and use, for understanding without*

		Water Centrality Principles	Water Centrality Questions	Expectations
		water, are aimed for from the outset	water?	*hidden meanings – flow and clarity. The language used must be plain and clear, using water metaphors where appropriate, with as little jargon as possible, for everyone to understand. Using water metaphors where appropriate enhances water awareness.*
7.3	a.	Government, private sector and civil society organisations are accountable to the public and the interests they represent including the water system	Are government, private sector and civil society organisations accountable to the public and the interests they represent including the water system?	*Some form of public review or accountability process should be in place (e.g. such bodies as the Auditor General, the Ombudsman or the Senate Estimates Committee could be utilised/adapted) to ensure that organisations actually deliver what they are supposed to and that the possibility for corruption is minimised. Such system should have a focus on water in all its forms, ensuring that the water system is represented and considered always.*
7.4	a.	Responsibilities are clearly assigned with accent on water	Are responsibilities assigned clearly with accent on water?	*Responsibilities need to be allocated to the organisation(s), person(s) or institution(s) that can best deal with particular elements of the water system so that good outcomes are ensured. All roles need to be well defined and supported (see 6.3) and need to include conflict management and resolution mechanisms (see e.g. Dietz et al., 2003).*

6.2.3 Assessment Procedure and Instructions to Users

For the purpose of assessment the WCI (Table 6.1) is expanded by two columns (see Appendix A). The first of these, entitled *Assessment (how is it done?)*, is used to enter the relevant sections of the evaluated item or summary of these in answer to the *Water Centrality* questions (taking the *Expectations* as a guide). Filling in the *Assessment* column requires either copying or paraphrasing relevant passages of the assessed document. In either case, page numbers, section numbers, paragraphs or other identifiers should be supplied for easy and accurate reference.

In the last column, called *Shortfalls → Improvements*, deficiencies (and adequacies) of the assessed item are identified, using the 'Expectations' as a guide for assessment, and suggestions for improvement are made. Any items that comply do not need to be changed and can be labelled 'none', although it may be useful to give details of the compliance. This latter point is especially important in cases where the final

presentation is limited to the last column, as in this thesis (see Chapter 7). Ideally the whole table should be presented but this may be too unwieldy and impractical if the assessment is substantial or very extensive (see Appendices B-D).

Some of the WCI sections or parts of sections may not be appropriate for all applications, e.g. items with an outline level higher than two (i.e. those items with three or four numbers) may be too specific for a substantive policy, whereas they might be required in a procedural policy, a plan or for guidelines. Initially, it may be a good strategy to complete the second level questions to gauge the overall compliance of an assessment item and then decide if further and more detailed assessment is required. Although third and fourth level items may not be needed in the assessment of a substantive policy, it is still desirable to look at the questions, as they may be applicable in a specific case or they may be worth considering because of their relevance to processes or documents that the policy is trying to influence or instigate. In cases where questions do not apply 'N/A' (not applicable) can be entered in the form.

Once the table is complete, the last column forms the basis for the final assessment of compliance with or suitability for *Water Centrality* of the assessed item. This entails the summary of findings with emphasis on shortcomings and particularly ways of improvement, in which not only the number or shortcomings/improvements needs to be considered but also their context and extent. For example, if there are many shortcomings in the 'second level' items (e.g. 1.2), then this is likely to be of more concern than if items of a higher outline level are found to need improvement. Eventually, it needs to be decided if items can be changed or adjusted to meet the *Water Centrality* Principles. If the number of non-compliant items is significant, the recommendation would have to be to replace the whole item.

Obviously, this final assessment is a judgement that needs to be made with as much care as possible, although care should also be afforded to the whole assessment process. Awareness of the subjectivity of this process is important. Ideally, an assessment should not be undertaken by a single person, unless the circumstances demand this, but by a number of people who do an assessment separately and then collate their findings (which can be a substantial undertaking but ensures some independence). Other options are that one person does an assessment that is then reviewed by others, which may be less time-consuming but not independent, or a whole

group does an assessment together, which is probably most conducive to the participatory, inclusive spirit of *Water Centrality*.

6.2.4 Limitations and Potential of the WCI

The *Water Centrality* Instrument is foremost a guidance document that can assist in designing or evaluating a programme, policy or other activity or document for compliance with *Water Centrality*. At the theory or intentional level, as in the case of policy evaluation, the existing instrument should be sufficient to indicate compliance. It ensures that all issues relevant to *Water Centrality* are considered. In some situations or applications, the WCI may need to be supplemented by other processes or methods, such as quantitative and qualitative data collection.

Since the WCI in its present form as evaluation guidelines represents only one potential use for the practical application of the WCP, it may require modification or may have to be completely redesigned for other uses, such as a planning tool, a compliance checklist or as an audit tool for use in very specific situations at a local level. It also should be adapted to suit the specific situation in question, e.g. for an evaluation using a subset of the WCP or for use with particular groups, such as school children. This should be unproblematic as long as the principles are adhered to.

The WCI may be less useful as a guide for implementation since it is not sufficiently prescriptive; it mainly indicates *what* is to occur but is limited in its descriptions of *how* things are to be done. However, the guidelines can be used to design prescriptive tools which, in accordance with the WCP, should be done in a participatory process.

According to Zube (1984) evaluation is an important tool for improved decision-making because "it provides feedback, systematic learning from past experiences, and guidance for the future" (p. 2). Evaluation is an integral part of making judgements and decisions involving comparison of alternatives. It is also a moral and political matter and is influenced by values, which should be made explicit (Williams & Hawkes, 2003).

In some cases, evaluation can be used prospectively (Alter & Patterson, 2006) or *ex ante*. The use of a values-based checklist, such as the WCI, is one way of approaching this; another may involve the use of simulation models, which may be helpful in estimating the prospective success of certain interventions or activities and making recommendations for policy makers (Alter & Patterson, 2006).

Other uses of checklists such as in the evaluation of existing policies, systems, programmes, institutions, processes, etc. (e.g. Stufflebeam, 2002) or alignment and integration of policy across government institutions (OECD, 2002) are examples of the more widespread *ex post* applications of evaluation, which comprise many different approaches and methods (please refer to the extensive literature on the subject). This latter more 'traditional' type of evaluation is concerned with the success or achievements of a programme or initiative. While much evaluation occurs in the context of single programmes or projects, i.e. case studies, sometimes over long time periods (e.g. Stufflebeam, 2002) it can also be applied to systems (e.g. Yin & Davis, 2007).

Much evaluation is built on the idea that the results should be useable by participants to improve the processes and outcomes of their activities (Williams & Hawkes, 2003). In order for evaluation to be meaningful, a baseline should be established against which change, progress or any measure that is desired can be compared. In this way, evaluation is an educational tool and every evaluation event is a learning or educational opportunity (Monroe, Fleming, Bowman et al., 2005).

In the context of learning and social change, co-evaluation is a relatively new approach that may be of particular interest for *Water Centrality* since it is seen as a holistic approach to evaluation in which all relevant persons in a programme or organisation are engaged together in an evaluation process, e.g. funders, administrators, implementers and evaluators (Williams & Hawkes, 2003).

Mainstreaming of evaluation may also be of interest for *Water Centrality*. The 2001 annual meeting of the American Evaluation Association focussed on this idea that endeavours to make evaluation a public good and part of society, its activities and processes at all levels, and an 'autonomous service discipline' (Williams & Hawkes, 2003).

Mainstreaming of evaluation means that evaluation is part of 'everyday' practice and accepted as part and parcel of an organisation or society and its processes (Williams & Hawkes, 2003). This may require a cultural change within an organisation or institution (or society), which can be challenging, and requires vision, guidance and active intervention that should be supported by education and capacity building. In order for evaluation to be considered mainstreamed, it needs to be "regular, continuous, collaborative, doable and viewed as helpful learning opportunit[y]" (Gray 2001 cited in Williams & Hawkes, 2003 p. 64).

In summary, the many presentations [at the conference] appeared to agree that mainstreaming involves using evaluation results to improve practice and ask better questions, overcome resistance to worthy evaluation efforts, respond to local experience (positive and negative), build an evaluation culture, capacity, and a common language, provide leadership for all of this, build on how people relate to one another, and much more. Using the stream analogy, […] participants viewed mainstreaming as the merging of two or more rivers into one. The evaluation river is developed, and as it evolves among social scientists and consultants it should blend wisely with the cultural, organizational, and political rivers of our societies. But there are warnings and cautions, too… (Williams & Hawkes, 2003 p.65/66).

In any assessment, a broader context with regard to associated policies, plans or other relevant documents should be considered, which may lead to further assessments of these associated items. In addition, policy gaps may emerge which may stimulate the formulation of additional policies or guidelines and/or other relevant documents or processes. This is to be expected, especially in the beginning, as not many documents and processes are designed in accordance with the proposed WCP. A growing number of assessments should bring about increasing knowledge and should also lead to some simplification of the whole process over time, particularly since documents can be cross-referenced.

There may be more uses conceivable and possible for the WCP, some of which will be explored in Chapter 8, however, at present and for the purposes of this thesis, the most fitting application of the WCI is as part of policy evaluation or analysis.

Policy evaluation can be descriptive or prescriptive, a distinction based on how policies are made and how they should be made, with the real value of policy analysis deemed to be in its prescriptive form that should augment policy advocacy rather than replace it (Hogwood & Gunn, 1984). The *Water Centrality* assessment process and outcomes have elements of both since they examine what a policy does and how it is done as well as identifying deficiencies and making recommendations for improvement.

Essentially, the WCI is a tool for prescriptive policy advocacy, highlighting shortcomings and changes that should be made to a policy, if *Water Centrality* were the declared goal. By being prescriptive, the danger is that the abstract may not translate successfully into the real world with its complex organisational and political situations with different organisations requiring techniques and mechanisms specific to each in order to work (Hogwood & Gunn, 1984). These valid concerns may be allayed through the application of some of the WCP themselves (e.g. those that relate to institutional

capacity) and by using the WCI in the selection and design of appropriate tools for implementation.

While traditional policy analysis examines the difference between policy intention and outcome, an interpretive approach studies the meaning of policy and highlights that multiple, sometimes ambiguous or even conflicting meanings, can coexist. The interpretive approach also accepts that the policy formulation process needs to be included in the analysis since the associated debates and meanings will influence the implementer's perception of the policy issue, and therefore policy implementation (Pülzl & Treib, 2006).

Interpretive analysis accepts that policies can have multiple meanings since their formation often involves accommodating opposing concerns, and that policies only express publicly expressible goals while agencies also have to implement other, hidden, goals (Pülzl & Treib, 2006). Hence, this approach also includes the study of the process of problem determination and definition and the communication of meanings. It also assumes that policy statements are not only rational and goal-oriented but that they are expressive and can reveal the distinctive character of a polity (Pülzl & Treib, 2006).

> Symbols, metaphors and policy language, which embody multiple meanings, are embedded in what Yanow (1987: 108) calls policy "culture". It is the analysts' main task to examine how different actors interpret this policy culture and then track down the effect of these multiple understandings on the implementation process. (Pülzl & Treib, 2006 p.16-17).

Clearly, an interpretative approach to policy analysis allows for much greater depth in understanding than the traditional method, but it also requires much knowledge and insight with regard to all the players as well as implied and hidden meanings, which can be difficult to obtain (Considine, 1994). The way the WCI is applied here is mainly restricted to the policy documents themselves and informed by only limited additional information and common knowledge, hence it is not a truly interpretive application and therefore not capable of achieving really broad understanding. However, the WCI could be used as a guiding document for a full interpretive analysis, and by facilitating this in-depth understanding give more insight into how policy making and other related processes may need to be changed to approach *Water Centrality*.

The WCI can also be accessed through systems analysis, which seems a fitting approach since *Water Centrality* is based on a systems approach. There are two types:

systems analysis *of* policy and systems analysis *for* policy. While the first approach has proven difficult and has not progressed much, the case for the second has been made repeatedly but has also not been applied much in practice due to the complexity of systems and problems of simplification (Stewart & Ayres, 2001). However, Stewart and Ayres argue that the real value of systems theory for policy lies in its ability to enable "analysts to get a handle on complexity by reconceptualising the task of exercising influence", according to the assumptions that "the nature of a problem cannot be understood separately from its solution" (Stewart & Ayres, 2001 p.79). An outline of potential solutions and associated requirements as well as influences achieved through policy and other means will follow in Chapter 9.

6.2.5 Visual Representation – the AMOEBA

In order to exert influence on a system and do so in the right direction with appropriate effort, it would be useful to have an easily understood representation of assessment results. A variety of visual aids are conceivable, one of which, the AMOEBA[33] approach introduced by Ten Brink et al. (1991) for water management in the Netherlands to conceptualise the state and sustainability of marine ecosystems, appears to be one of the most appropriate. Originally, this easily understandable, visual tool was used to compare verifiable quantitative objectives to an ideal or sustainable state of an ecosystem (described in Bell & Morse, 1999 and Kellett, 2005 #934). System performance of a number of different aspects is assessed and depicted as a 'spider web' figure in which actual performance is compared to the expected or possible performance (Pastore & Giampietro, 2000). Different AMOEBAs can then be compared to each other, either over time or across systems. A similar tool has been used by Yin and Davis (2007) to illustrate the different states of reforming a school system using both quantitative and qualitative measures.

Both Ten Brink's and Yin's approaches require some adaptation for use with the WCI since its outcomes are predominantly qualitative. Figure 6.1 shows an AMOEBA with seven 'spokes' that represent the seven WCP with dissecting concentric circles that correspond to different levels of *Water Centrality* compliance (dark grey centre circle = 'no compliance' to outer white ring = '(near) total compliance'; the steps in between could be classed as 'little compliance', 'some compliance' and 'good compliance'). Since there are five rings or levels, the compliance levels could be assigned on a

percentage basis with each level representing a 20% step. Connecting the dots of the level of compliance marked on each of the seven spokes results in an AMOEBA figure. A hypothetical example is shown in Figure 6.1.
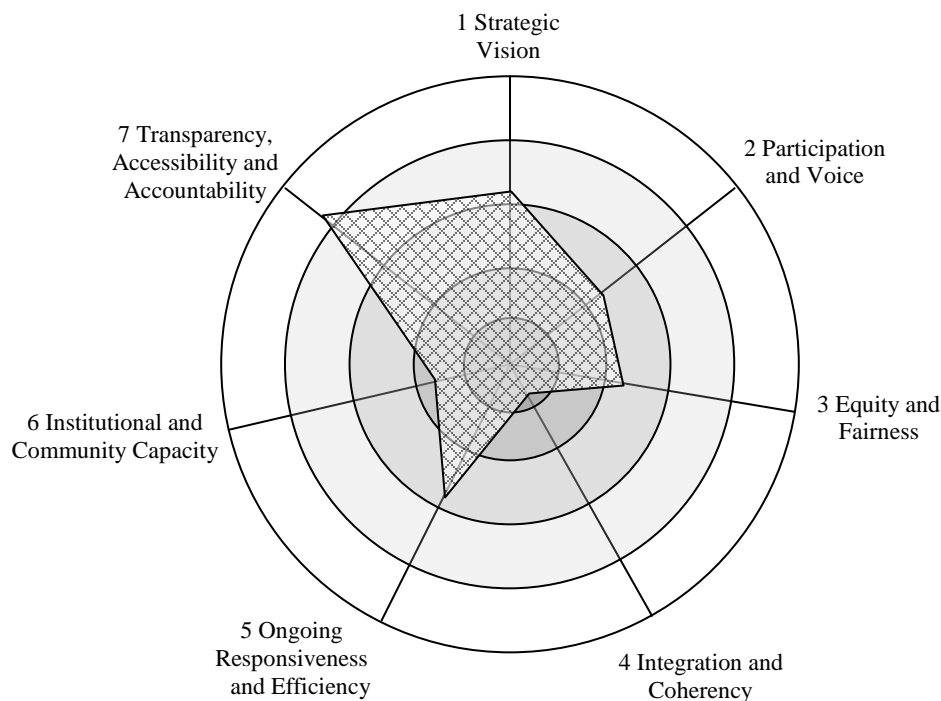
Figure 6.1: *Water Centrality* Compliance Visual Tool (Based on AMOEBA)
Showing a Hypothetical Example

While the WCI itself is not a matrix and has no quantitative elements or explicit ratings, it would be possible to take each of the principles and rate the sub-points on a scale of 1-5 (or assign a percentage compliance or rating from total compliance to no compliance), take the average of all these ratings and make this the basis of the AMOEBA. Alternatively, a rough overall assessment of compliance of the higher level points can be made and entered on the AMOEBA. Obviously, this approach of visualising *Water Centrality* compliance is even more subjective than the assessment itself since it represents an extra level of interpretation; however, it could serve as a useful, quick means of immediately comparing the *Water Centrality* compliance levels of assessed items with each other particularly, and over time in some cases.

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[33] AMOEBA is the Dutch acronym for "a general method of ecosystem description and assessment." (Kellett, Bristow & Charlesworth, 2005 p.35)

The issue of comparing the different principles with each other would also need further consideration since the AMOEBA implies an equal weight or importance for each of the principles. It also 'hides' the sub-points and any glaring omission or problem can be hidden by good scores from other sub-points. Nevertheless, a visual representation of the *Water Centrality* compliance levels may be a useful addition to the WCI, and it may be worth exploring similar visual representation types or options.

The use of both the WCI and the *Water Centrality* AMEOBA are demonstrated in the next chapter in the form of three case studies.

Chapter 7

Water Centrality Instrument: Case Studies

In this chapter, the evaluative use of the WCP is demonstrated for existing policies using a *Water Centrality* Instrument (WCI) derived from the WCP. It will be applied in three case studies, two of which deal with water explicitly and one dealing with water implicitly through mental health. The *Intergovernmental Agreement on a National Water Initiative (NWI)* (COAG, 2004b), the *Western Australian Environmental Water Provisions (EWP) policy* (Water and Rivers Commission, 2000) and the *'Infancy to Young Adulthood': A Mental Health Policy for Western Australia* (Department of Health, 2001) are all examined for their compliance[34] and shortcomings with regard to the WCP.

All three policies are evaluated for their overall suitability for *Water Centrality* with the aim of determining if their total replacement is required or if changes may be sufficient. This process should also indicate if the Western Australian (state) and federal governments are essentially moving towards *Water Centrality*. The outcomes are also envisaged as giving an indication about who will have to be involved in making changes and what will need to be done for those changes to occur. It is anticipated that some of the obstacles to reaching *Water Centrality* will emerge, informing the whole process of moving towards a water society. Reflection on the WCI application highlights advantages and disadvantages of this process resulting in recommendations and cautions for its use.

The aims of this chapter are:

- to demonstrate the use of the WCI with three case studies;
- to evaluate the two policies for their suitability for and compliance with *Water Centrality*;
- to represent the level of *Water Centrality* compliance using the *Water Centrality* AMOEBA;

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[34] The term 'compliance' is, strictly speaking, not appropriate in a hypothetical context such as this, since the evaluated policies cannot comply with principles that do not yet exist 'out there' in the real world. However, since 'compliance' would be the appropriate term to use if the WCP were accepted, it seems better to retain the term rather than risking inaccurate portrayal in the case studies by replacing it with a word such as 'correspondence', 'conformity' or 'agreement' that does not adequately express its meaning.

- to evaluate the WCI and its application; and
- to gauge the level of *Water Centrality* present in the Federal and WA Governments and identify some of the obstacles to the adoption of *Water Centrality* in Australia.

7.1 Application

Three documents were chosen to demonstrate the application of the WCI. The first, the Intergovernmental Agreement on a National Water Initiative (NWI) (COAG, 2004b) is a national strategy document and, as the highest level strategic document for water management in Australia, has wide-ranging consequences and a clear connection to *Water Centrality*. The second, the Environmental Water Provisions Policy for Western Australia (EWP policy) (Water and Rivers Commission, 2000), is an important policy for water allocation, that, for the first time in that State, refers to social water requirements (SWR), and was the original reason for writing this thesis. Both these policies have obvious and direct relevance to *Water Centrality* because they deal with water and its management.

The third document, the 'Infancy to Young Adulthood': A Mental Health Policy for Western Australia (Department of Health, 2001) is also a state level policy. It was chosen because this subject is not normally or explicitly associated with water so that the relationship of such a 'non-obvious' field with *Water Centrality* in general and the WCI application process in particular can be demonstrated.

Another criterion was that these documents need to be discrete documents easily available on the Internet. The case studies are undertaken in turn, beginning with the National Water Initiative.

7.1.1 Case Study 1: Intergovernmental Agreement on a National Water Initiative (Council of Australian Governments, 2003)

The *Intergovernmental Agreement on a National Water Initiative* (NWI) (COAG, 2004b) is a substantial document (22 pages containing 102 paragraphs, and an additional 7 Schedules taking up 16 pages) as may be expected from a national strategic policy document. The Agreement was initiated by the Council of Australian Governments (COAG) under the leadership of the Prime Minister (Turnbull, 2006), who is also the chair of the COAG (2005). The NWI was adopted in 2004 and has now

been signed by all Australian states and territories after originally Western Australia had declined to sign and Tasmania was unable to do so (COAG, 2004a).

> COAG noted the continuing national imperative of increasing the productivity and efficiency of Australia's water use and to ensure the health of river and groundwater systems. This will require arrangements that provide greater certainty for investors in the water industry and for the environment, and which will allow Australia's water management regimes to adapt to future changes in water availability responsively and fairly in both rural and urban areas.
>
> COAG agreed to a National Water Initiative (NWI) covering a range of areas in which greater compatibility and the adoption of best-practice approaches to water management nationally will bring substantial benefits. (COAG, 2004a)

There is a $2 billion Commonwealth commitment in the form of the Australian Water Fund associated with the NWI. The money is used in three programmes: *Water Smart Australia*, which is primarily promoting the development and uptake of 'smart' water use technologies and practices; *Raising National Water Standards* invests in the capacity to measure, monitor and manage water resources; *Australian Water Funds Communities* provides grants to promote wise use of water in communities (*National Water Initiative*, n.d.).

Since the states in Australia have the constituted responsibility for water, this agreement marks a new era in water management, one in which the Commonwealth plays a coordinating and strategic role. The formation of the Australian Government Office of Water Resources (OWR) in the Department of the Prime Minister and Cabinet by the Prime Minister in September 2006 strengthened this intention, which was reinforced with renaming the Department of Environment and Heritage into Department for The Environment and Water Resources (DEWR) in January 2007. The OWR was established "to provide greater Commonwealth leadership in the sustainable management of Australia's water resources" (Australian Government, 2006). Its responsibilities are to provide water policy advice and co-ordinate "the implementation of government water policies across Commonwealth departments and agencies" and to assist a Commission (NWC) in overseeing the implementation of the NWI (Australian Government, 2006). Effects of the changes to the Department for The Environment and Water Resources will remain to be seen but the move clearly indicates the growing realisation of the importance of water for Australia.

Since the NWI is administered through a variety of organisations these should also be assessed for *Water Centrality* compliance, but this is not feasible in this thesis therefore only the NWI is assessed. For practical reasons only the last column of the assessment is presented here (Table 6.2), since the complete WCI application is very large (see Appendix B). So that the need for referral to the WCI or any other document is minimised, the contents of the last column were chosen with special care to ensure clarity with regard to the required improvements.

Table 7.1: Application of the *Water Centrality* Instrument to the *Intergovernmental Agreement on a National Water Initiative* (NWI) (COAG, 2004b) (for full application see Appendix B; please use the *Waterbookmark* as reference for the WCP)

		Shortfalls → Improvements
1		**Strategic Vision**
1.1	a.	*Since the NWI is a national high level policy an actual vision may be desirable that has appeal and is inspiring to all people of Australia. The objectives (s.23) are clear but not inspiring, since they lack emotive appeal and colour, and there is no clear reference to the long-term.* *A vision should also have a broader context i.e. refer to the whole water system and have less emphasis on markets and the economy. The key elements (s.24) refer to integration without including economic aspects.*
	b.	*A federal level water policy vision should reflect* Water Centrality *and relate to the whole water system, which this one does not do. It should include all life forms and their wellbeing, acknowledging the central role of water in this.*
	c.	*The objectives and the goals of the NWI should refer to the whole water system (i.e. blue AND green water, water vapour and virtual water, also waste water – black & grey) and need to be broadened to reflect the importance of water for all life and ecosystem services on which we depend.*
1.2	a.	*There is no reference to ethical principles in the NWI. This should be remedied, but could be done by referring to a future* Water Centrality *Charter that would have to be a document based on ethical principles (see Chapter 8).*
1.3	a.	*Agreement is achieved at the state/territory and federal level but does not necessarily extend to the community, which is appropriate for a representative democracy as exists in Australia at present. However,* Water Centrality *is a participatory democratic approach and there should be provisions made for seeking consensus or agreement on the NWI Agreement at a broader scale (include bottom-up approaches in addition to top-down).*
2		**Participation and Voice**
2.1	a.	*There is reference to some specific stakeholder groups, such as indigenous groups and downstream users, but overall reference to stakeholders is very general. Specific, and traditionally disadvantaged or disregarded groups, such as women and youth, as well as non-human life forms should be explicitly mentioned so they do not get neglected or overlooked*
	b.	*Ensuring that diverse and changing values are captured through ongoing participatory processes should be enshrined and be made prominent in the policy.*
2.1.1	a.	*The NWI does not make any reference to Human Rights, including freedom of association and speech. It is unclear what the exact situation is in Australia since the Convention of Human Rights has not been translated into law in Australia. This may need to be addressed in a different forum.*

		Shortfalls → Improvements
	b.	*Participant capacity is not considered in the Agreement but is an important aspect that should be included by providing open, accessible and fair processes that are tailored to participants' needs in order to make participation effective and equitable.*
2.1.2	a.	*The NWI was initiated by decision makers and they are involved in administration, planning and allocation processes on an ongoing basis, hopefully ensuring a secure link between policy and action.*
3		**Equity and Fairness**
3.1	a.	*There needs to be more explicit recognition of the ecological basis for life, and equity amongst life forms needs to be acknowledged more clearly.*
	c.	*The limited recognition of water should be broadened to include green water and virtual water as well as the importance of water for all ecosystems and their services.*
3.1.1	a.	*Access to water is mainly considered with regard to water markets and should be broadened to include other aspects such as health and wellbeing, both for humans and other life forms. This should include considerations of water quality, quantity and the full spectrum of human psychosocial water uses.* *The role and function of water utilities and water services could be made clearer.*
3.1.2	a.	*Water resource use and overconsumption are considered but without direct reference to intra- and intergenerational equity, implied only in the relatively frequent reference to sustainability in the text; however, sustainability should be defined and/or reference be made to the National Strategy for ESD (1992) at the beginning of the document (see also 4.1.a).* *Pollution, poverty or human rights are also not explicitly addressed. This needs to be remedied.*
	b.	*It needs to be ensured that the relationships of the items in 3.1.2.a to water are considered when 3.1.2.a. is expanded*
4		**Integration and Coherency**
4.1	a.	*The NWI addresses many parts of the water system but this is not done in a systematic way. It should make reference to all parts of the water system including rain water and water vapour as well as waste water and stormwater and the receiving environments such as oceans. Virtual water also needs to be considered as do all the relevant institutions other influences.* *The NWI would be a prime document to include, or at least to initiate and refer to, a review of the whole water system and its parts including their interconnections.* *Problems and areas lacking in knowledge could be identified and addressed at a strategic level helping to coordinate efforts and identifying knowledge gaps, research priorities and policy and funding requirements.* *A thorough review of the whole water system, its parts and interconnections would be helpful for many lower level policies and plans that could refer to it and build on it, and it is essential for a water society.*
	b.	*There is no reference to the central role of water nor is this being made explicit anywhere in the document. In particular the preamble needs to be amended and should refer to UN or other documents that recognise the important role of water for life.* Water Centrality *should be affirmed.*
	c.	*There needs to be a more thorough representation of all water cycles considering as many potential impacts and implications as possible. This needs to go hand in hand with a review of the whole water system (see 4.2.a).*
	d.	*The connections and interdependencies of water need to be explored in more detail and more fully, including indirect ones, such as ecosystem services. This should be part of the review of the whole water system (see 4.2.a).*

		Shortfalls → Improvements
	e.	*The list of areas in need of knowledge is substantial but far from complete. Full knowledge of the water system is not possible but there is much untapped or dispersed knowledge that could be compiled here. The agreement only aims to identify areas pertinent to its implementation which is not sufficient to cover the whole water system. There is no specific reference to local or traditional knowledge and the agreement needs to include that.*
4.1.1	a.	*The ecological subsystem is recognised to a limited extent, mainly with regard to water bodies as such and water dependent ecosystems. Consequently, there needs to be broader recognition of ecological values to include not only directly water dependent ecosystems but also indirect effects and ecosystem services. The need to identify the direction and rate of change of the ecological subsystem is not specifically recognised although audit and review processes could be used for this purpose. This should be remedied.*
	b.	*Social considerations are acknowledged in conjunction with environmental values, except for indigenous cultural and spiritual values which are mentioned separately. Social issues appear to be dealt with as an aside, subservient to economic and market considerations. Social considerations need to be dealt with more explicitly and in more detail, ensuring they are given at least equal weight or in some cases precedence over economic considerations.*
	c.	*A clear bias towards the economic subsystem exists which is taken into account to a much greater degree than the other two (11 of 22 pages in the Agreement are devoted to water markets, pricing and accounting). A better balance between all subsystems is needed. In contrast to the other subsystems there are provisions for a review of economic impacts with adjustments made based on the findings.*
	d.	*Interactions of the subsystems are explored to a limited extent and this needs to be broadened considerably. Direction and rate of change is not referred to explicitly, with the exception of the economic system and overallocated system. This should be addressed to enable comparison and progress evaluation.*
4.1.2	a.	*Costs and benefits are not clearly identified and need to be broadened especially with regard to non-monetary elements.*
4.1.3	a.	*Few ecosystem services of water are considered and they need to be explored and included more fully (see also 2.1). This includes the direct and indirect roles of water in climate, weather, plant growth, soil formation, nutrient cycling, etc. (see e.g. Millennium Ecosystem Assessment, 2005 for details).*
	b.	*Economic activities are not linked to human wellbeing and this should be made more explicit throughout the document.*
	c.	*There is only limited recognition of non-monetary values and they should be identified more extensively, including indirect ones.*
	d.	*The interactions of 3.4.a-c need to be explored more fully after taking the suggestions for each of them into consideration.*
	e.	*While the local and regional contexts are considered the global context is not considered but should be explored as well for a more complete picture.*
4.1.4	a.	*Timeframes are set to deal with implementation and administration but have little to do with water cycles. Better exploration of all water cycles and their associated time frames is needed which should be reflected in the policy as well as in water plans.*

		Shortfalls → Improvements
	b.	*Timeframes should be specified more clearly, e.g. how long is 'ongoing' (Schedule A)?* *There is one reference to sustainable use of water resources, water infrastructure assets and government resources (s.64i) as well as provision for secure ecological outcomes and resource security outcomes through water planning (s.37i&ii) in case the decision is made that a plan is required (s.38).* *This is not sufficient as a commitment to long-term management and to future generations; such a commitment needs to be formulated and expressed clearly.*
	c.	*Time scales appear to be appropriate for short-term decision making.*
4.1.5	a.	*Local and regional impacts of water abstraction, interception and use are considered sufficiently. However, other more long distance elements including air and vapour movements or climate change are not mentioned but should be accounted for.* *Effects of trade within the MDB[35] are considered but effects of inter-basin water trading also need to be included.*
4.1.6	a.	*Besides indigenous cultural and customary water uses, which are taken into account to some extent in water allocation, there is no mention of any other heritage except that of some 'water sensitive urban design icons' (s.92 iii) and legacies to do with administration, accounting and previous overallocation of water.* *Historic considerations need to be expanded to include post-immigration history, previous ecological conditions besides those threatened by overallocation and effects of existing administrative boundaries.*
	b.	*While some existing conditions are considered (those related to environmental water and overallocated systems), they are all pertaining to blue water and there needs to be more information about indirect aspects, such as ecosystem services of water, green and virtual water, as well as waste water (grey and black).*
	c.	*Some possibilities are explored but there is no open and full exploration of all possible options, e.g. there is no question if water markets are the best option and other alternatives are not even mentioned. It is also unclear if different options are explored in the preparation of water plans.* *In the preparation of plans a full exploration of all possible models and options, even those that appear utopian or impossible, should occur (in a participatory manner) so that the best possible one can be chosen.* *Overall, a public debate with regard to water planning and management should be continuous exploring alternative options besides and including water markets.*
4.1.7	a.	*There is no set of categories or framework suggested for use in the set of performance indicators, but it remains to be seen how this task is completed. A framework or similar should be employed for consistency and coherency.*
	b.	*The framework recommended in 4.1.7.a should be designed so that water is of central concern and that all indicators reflect that.*
4.1.7.1	a.	*There is a limited set of key issues (s.24) but they are also limited in scope: 4 of 8 elements deal with entitlements, markets, pricing and accounting. The other 4 deal with 'integrated management for environmental and other public benefit outcomes', urban water reform, knowledge and capacity building, and community partnerships and adjustments. There should be a better balance and spread of issues.*
	b.	*The key issues should be chosen to reflect the WCP better, without overly emphasising one principle or issue, as is the case here (see 4.1.7.1a). A better representation of the WCP would be desirable to better reflect e.g. equity or transparency.*

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[35] Murray-Darling Basin

		Shortfalls → Improvements
4.1.7.2	a.	*N/A at present. Indicators to be developed by the NRMMC and NWC;* Water Centrality *Principles should be used as a guide.*
4.1.7.3	a.	*Only with regard to metered water is there reference to standardised measurements. There is no mention of other measurements, but measurement and monitoring of environmental and social requirements and for non-metered water (including green water) should be included. Measures do not have to be only quantitative.*
	b.	*When broadening the scope of measurements (see 4.1.7.3a) they should relate to water and the WCP.*
4.1.7.4	a.	*While indicator values are not directly a concern of this policy, a recommendation to compare indicator values to targets, reference values, ranges, thresholds or directions of trends would be useful to ensure that this occurs in water plans.*
	b.	*It should also be ensured that these indicator values relate to the water system, directly and indirectly.*
4.1.8	a.	*Any information derived from indicators and other tools should be relevant and of interest to decision makers.*
	b.	*Such information should all be related to water and show the connections with water in case this is not obvious, as e.g. for indirect values*
4.2	a.	*The complexity of water systems is recognised to a certain extent but should be acknowledged to a greater degree beyond geographic and climatic variability and the 'mere' balancing of economic, environmental and social aspects and groundwater-surface water system interconnections* *Although nationwide compatibility of WRM is stated as the main aim this is mainly envisaged for trading, markets and water accounting. Environmental considerations should be broadened to include wider ecosystem services.* *The national registers of allocations and environmental water as well as the improved coordination of data collection and management are only the start for a truly coherent approach and should be expanded to include research, policy and planning as well as be tied in with other legislation.* *Reference is made to the COAG water reform framework (1994) but other relevant policies and initiatives, e.g. the National Strategy for ESD (1992), are not mentioned, although they are still relevant and applicable today and forerunners for this Agreement (see also 3.1.2.a).*
5		**Ongoing Responsiveness and Efficiency**
5.1	a.	*The Agreement's intention is to serve all relevant stakeholders including the environment; however, it is very much biased towards markets and economic considerations. It is also hazy with regard to some details concerning community participation and ecosystem services other than those related to blue surface water and ground water.* *More detail with regard to stakeholders is needed and the approach to water needs to be less biased towards market and economics and has to be broadened (see 2.1 and elsewhere). Water should be seen in a much broader context and all its values considered. It should be regarded as a stakeholder, not merely a resource.*
	b.	*The commitment to adaptive management is biased towards the consumptive pool and although other aspects are included there needs to be a broader approach to risk and uncertainty, also taking into consideration indirect ecosystem services of water and other forms of water besides blue surface and groundwater.* *There is little reference to institutions and their adaptiveness, which should be rectified so that adaptiveness is built into both processes and institutions alike; this may require a separate policy or guidance document. All these adjustments should ensure that particular attention is given to changes and uncertainties*

		Shortfalls → Improvements
		relating to the water system.
5.1.1	a.	*The requirement for monitoring, audit and review exist, however there is little specific reference to capacity besides the implied abilities of the NWC, the parties' staff and consultants that may be used to carry out review and assessments.* *There should be some reference to the capacity and ability of reviewers and also how often these audits and reviews occur and what happens with the results, especially in case of negative outcomes.* *A commitment to adaptiveness may also be usefully made in a separate document since it also may entail some broader restructuring of government institutions.*
	b.	*It should be ensured that the water plan objectives as well as audits and reviews are using measurements that clearly show effects on the water system.*
5.1.2	a.	*Performance review seems well established, but is mainly related to implementation and the performance of the water industry regarding pricing, irrigation efficiency and water management. It is unclear what happens in cases of insufficient progress or non-compliance and information should be provided for such eventualities.* *Overall, there should be more emphasis on the water system and a much broader context that also includes the community and other government organisations.*
	b.	*There is no reference to adjustment of goals or indicators, with regard to any new knowledge. While too much detail may not be applicable here goals should be adjustable and the whole agreement should be open to review and adjustment, not just the NWC. Such review should place particular emphasis on new and emerging knowledge that relates to water.*
5.1.3	a.	*There are certain avenues for appeal and community input, but feedback on decision making is not encouraged specifically.* *Consideration to feedback should be given and avenues put in place to enable and encourage feedback on decisions, particularly those relating to water beyond those provided through consultation processes.* *This may require another separate process and guidance as part of the establishment of a water society.*
5.2	a.	*Search for knowledge is encouraged and priorities will be identified, but there is no information about who is involved.* *Both knowledge seeking and learning needs to involve the community and partnerships in learning should be promoted (e.g. Pahl-Wostl, Sendzimir et al., 2007).*
	b.	*There is emphasis on learning about water and the water system with certain specific needs identified.* *What is missing is commitment to learning and facilitation of water literacy, which should involve the whole nation at all levels, not only the research institutions (see 5.2.1) (Centre for Ecoliteracy, 2000).*
5.2.1	a.	*The search for knowledge seems well enshrined but should explicitly include traditional and indigenous knowledge.*
	b.	*Much of the agreed knowledge seeking concerns water, although the more indirect connections with water could be strengthened.*
5.3	a.	*Economic efficiency is a high priority throughout the NWI but it should be broadened and strengthened together with ecological effectiveness to include other forms of water and indirect ecosystem services to ensure a functional whole water system.*

		Shortfalls → Improvements
6		**Institutional and Community[36] Capacity**
6.1	a.	*There is little indication given about support in decision making processes and more information should be provided to ensure that decisions are consistent and well-founded.*
	b.	*Decision support should be suitable for water and ensure that all water values and direct and indirect concerns are considered as appropriate.*
6.2	a.	*Sufficient institutional capacity seems to be provided, although there appear to be many assumptions with regard to provision of capacity by the states as well as in the NWC that are not spelled out. Although details on this may not be necessary some general reference to appropriate capacity should be made (which also includes the appropriate resources).*
	b.	*Although there are some water specific provisions made for institutional capacity, they may have to be broadened to ensure that the whole water system with its direct and indirect elements is catered for.*
6.3	a.	*There is commitment to institutional capacity building and adjustment to the requirements of the Agreement. Adjustments have to be carried out by 2006 but there is no mention if this is to be ongoing and it appears to be a one-off event. Institutional capacity building priorities are identified but it is unclear if this is ongoing or also a one-off occurrence.* *There should be a clear commitment to* ongoing *institutional capacity building and renewal at all levels.*
	b.	*Institutional capacity building and renewal should not only consider specific and obvious water issues but cater for the whole water system and all water values.*
6.4	a.	*While knowledge and capacity building are recognised as a key element, neither community capacity and community capacity building nor any of their elements are specifically mentioned in the agreement and this should be rectified.*
6.4.1	a.	
	b.	
	c.	
	d.	
	e.	
	f.	
	g.	*Any community capacity building and development should have water as a focus to foster water literacy.*
6.5	a.	*The agreement should be broadened to include all forms of water (see 4.2) and the relevant institutions need to be enabled to deal with this.*
7		**Transparency, Accessibility and Accountability**
7.1	a.	*It appears that there is provision for information to be made available and for reporting, however, it is unclear how most of this is to be made public, accessible or is being distributed and information needs to be provided on this.* *There is little reference to active distribution of information, which should be rectified.*
	b.	*The information referred to in the NWI should be broadened so it does not only relate to specific issues but to the whole water system.*
7.1.1	a.	*As long as an interested person is literate and knows where to look information (especially on water entitlements) is accessible and available; although it is not clear how accessible data and methods are. With regard to understand-ability and format, no information is given but some form of general reference or*

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[36] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others (Adams & Hess, 2001).

		Shortfalls → *Improvements*
		guidelines should be provided.
7.1.2	a.	*Although a variety of processes are identified their outline is vague and does not indicate how open and transparent they are, bar from general reference to transparency. This may be justified in those cases where a yet to be written document is referred to, although even then more detailed provisions to address these issues would be advantageous. Overall, some more clarity may be good but it remains to be seen how the processes actually operate in practice. An implementation review should be considered to provide such information (see also 5.1.1 & 5.1.2)*
		With regard to planning processes, it should be clarified what is meant by 'open and transparent' (s.25iii and Schedule E, s.6iii).
	b.	*While many of the processes mentioned are related to water the context should be broadened to include all aspects of the water system and all water values.*
7.1.3	a.	*Some judgments, assumptions and uncertainties are recognised and provisions made for in some cases to account for these.*
		Assumptions such as those relating to water markets are not made explicit as such; they are written as factual statements that do not refer to any underlying assumptions, such as the workability of markets, their failures and theory behind it all. The effects on the water system should be explored more broadly and include indirect effects.
		More clarity about underlying assumptions and interpretations should be provided beyond the definitions provided in Schedules B(i) and B(ii).
7.2	a.	*There is no direct reference to the user friendliness of the documents, processes and institutions or the needs of users, and such provisions should be added to the agreement or reference made to other relevant documents that may exist.*
		It may be useful to provide more generalised and overall guidance for a water society on matters of organisation, bureaucracy and administration, best worked out in a separate process, which can then be used as a reference in policy documents.
	b.	*While the NWI refers only to elements of the water system, the water plans would hold more detailed information. However, it needs to be ensured that the whole water system and all water values are addressed and considered in these plans; the NWI should make provisions to ensure this.*
		Guidance should also be given on the setup of institutions so that they are designed with water in mind in terms of processes, e.g. information flow and data pools, as well as their physical settings, e.g. buildings and infrastructure. This may be usefully done in a separate process producing a document that can then be referred to in the NWI but also in other documents where appropriate.
7.2.1	a.	*The Agreement could be set out much more clearly and its complexity could be reduced. A TOC would be very helpful and more explanations of terms used should be given. This document should be understandable to all Australians since it is an important national level document and everyone is required to take part in its implementation.*
		There is little 'water language' used in the document, which should be rectified to enhance its appeal and 'wateriness' and contribute to the metaphor.
7.3	a.	*There are review processes and some accountability assignment in place; however, there should be more detail on this, particularly regarding the public interest and the water system, also with regard to consequences in case of breaches or misconduct.*
7.4	a.	*Institutional responsibilities are assigned with regard to processes and administration but there are some unclear areas with regard to policing and non-compliance and how it all relates to the water system. Also, the responsibilities of the community and individuals with regard to water should be made clearer.*

In summary, in order to be water central, above all, the NWI Agreement should be broadened to include all forms of water and should refer to the whole water system (including blue, green and virtual water) acknowledging the central role of water for life. The almost complete lack of reference to social elements and ecosystem services (values of water) should be remedied. A stronger vision would be useful, which would best be tied to a clear expression of intent, such as a *Water Centrality* Charter (WCC) that would need to be compiled through a participatory process (see Chapter 8).

A high level policy such as the NWI that claims to have the wellbeing of the water system for all Australians at heart could be a good vehicle to *initiate* a review of the whole water system including all its interconnections. While this is now being addressed through the new water legislation (a bill was introduced into parliament in 2007) the first steps have been undertaken by the initiation of a Sustainable Rivers Audit (MDBC, 2008), but so far this is focussed on the Murray-Darling Basin and it remains to be seen how comprehensive and holistic it is and if it would be suitable as a 'template' for further assessment and review.

The NWI itself should be more balanced, reducing bias towards markets and economic aspects of water, which means that other areas pertaining to environmental and other social elements need to be strengthened. It is also important that interactions between all subsystems are explored and considered, including non-monetary values. Social aspects, such as education, welfare, housing, transport and health require strengthening throughout as well as other direct and indirect psychosocial aspects of water (see Chapter 2) while non-indigenous historic aspects, boundary effects and local and traditional knowledge also require attention. Environmental aspects need to be broadened to include previous ecological conditions and the full range of ecosystem services (direct and indirect), not only those that relate to water dependent ecosystems.

It is not clear if there was an exploration of different options before the agreement was drawn up and why this particular option was chosen. There is also no reference to a public debate before or after the production of the Agreement. This policy has the appearance of a 'top-down', 'stick-and-carrot' approach, in reflecting the initiating governments' political stance. It is unclear if feedback on the NWI was sought, and from whom, before it was signed by the different states. The limited material available on the Internet indicates that the NWI was an initiative by the Prime

Minister and while it was supported by COAG (COAG, 2004a) there appears to have been some dissent since Western Australia refused to sign the NWI initially. The likelihood of successful implementation of the Agreement could probably be increased by including community and stakeholders in its preparation.

The document itself could be more user-friendly, understandable and clearer in layout and language. A table of contents would be a desirable feature. Other points that should be considered are: measurement standardisation (qualitative and quantitative measures); recommendations with regard to elements that need to be contained or considered in water plans, e.g. an indicator framework that allows for a structured comparison of targets, thresholds, directions of trends, etc.; larger spatial scales with regard to various aspects, such as climate and long-distance water trading; more attention to equity, including specific reference to stakeholder groups, especially those that are traditionally disadvantaged, to avoid neglect; participant capacity to enable effective and equitable participation; greater attention to information distribution; explanation of what is meant by 'open and transparent' decision-making; more attention to underlying assumptions; more references would be helpful to increase clarity; clarification of what happens in case of non-compliance; and ongoing community involvement in decision-making, including feedback.

Many of the identified concerns relate to implementation and administrative matters which may be outside the scope of such a high-level policy. These matters may be covered by other policies, which should be mentioned in the document if this is the case; if not, it would be useful to provide broad guidance in the form of additional procedural policies or guidance statements. Underlying assumptions usually have to be gleaned from the larger context (government actions and non-action, political stances, etc.) and it may be useful to clarify some of these aspects to advance intended outcomes (possibly in the form of a vision statement, e.g. a *Water Centrality* Charter as proposed in Chapter 9).

There should be a clear commitment to adaptiveness and iteration, and review processes should be designed accordingly. This includes commitment to ongoing learning and search for knowledge in partnership with the community. It would be useful to address these issues in a separate policy, which should make reference to capacity of institutions as well as personnel and community capacity and support.

The NWI is not a sustainable policy; the bias towards economics and markets is too strong and many environmental and social aspects are neglected. Many of the identified shortcomings are valid even in the present (that is, not water central) climate and should ideally be addressed in order to improve the water management situation in Australia.

Figure 7.1 shows the AMOEBA for the NWI assessment which confirms the less than satisfactory *Water Centrality* compliance level. All first level principles are not fulfilled, in fact, only Principle 7 has achieved a level above the halfway mark.
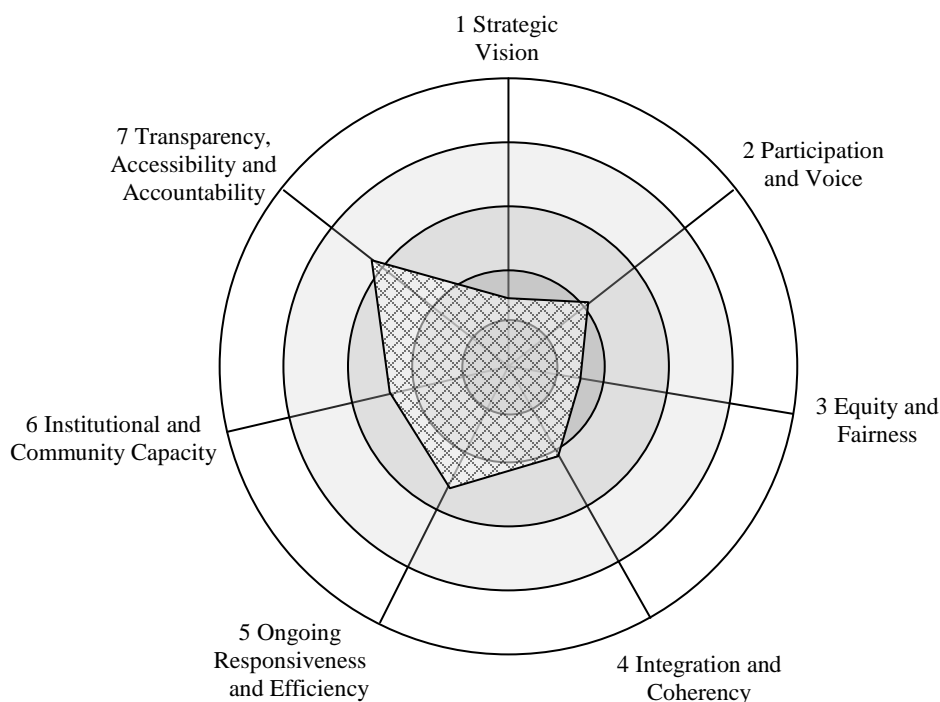
Figure 7.1: AMOEBA for the *Water Centrality* Assessment of the *Intergovernmental Agreement on a National Water Initiative* (NWI) (COAG, 2004b)

In conclusion, there is much room for improvement and, overall, in order to be water central, the NWI will have to be overhauled completely or, preferably, replaced.

7.1.2 Case Study 2: Environmental Water Provisions Policy for Western Australia (Water and Rivers Commission, 2000)

The *Environmental Water Provisions Policy for Western Australia* (EWP policy) (Water and Rivers Commission, 2000) was prepared as part of the then Water and Rivers Commission's (WRC) mandate to manage water use and protect important

water dependent ecosystems (WDEs). Making water provisions for the environment is part of a broader multi-objective decision framework that aims to be consistent with the *National Strategy for Ecologically Sustainable Development* (NSESD) 1992, and is mandated through the *COAG Water Reform Framework Agreement* as well as the amended *Rights in Water and Irrigation Act 1914* (Water and Rivers Commission, 2000).

The EWP policy is a 23-page document that includes a foreword, references, a glossary and four appendices as well as a publication feedback form. The actual policy covers ten pages in three sections. The policy was prepared in 1998/1999 and the submissions received during the public comment period in 1999 have influenced the final document. Due to its limited mandate and the level for which it is intended, this policy is expected to be more detailed and of a more procedural nature than the NWI.

Here, again, only the last column of the WCI is reproduced due to space constraints. The full assessment can be accessed in Appendix C.

Table 7.2: *Water Centrality* Instrument Applied to the *WA EWP Policy* (Water and Rivers Commission, 2000) (last column shown only; see Appendix C for full application; please use *Waterbookmark* for reference to the WCP)

		Shortfalls → *Improvements*
1		**Strategic Vision**
1.1	a.	*The primary objective does not refer to the whole water system, only to a component and needs to be put into the whole water system context. It also should be reformulated into a vision, and colour and emotional appeal should be added.*
	b.	*The vision needs to be broadened considerably to reflect the importance of water for life, since it so far only refers to WDE, although the definition could be interpreted as referring to all life since all of it depends on 'the permanent or temporary presence of water resources' (p.12).*
	c.	*The guiding principles (=goals) need to be broadened as well, so that they reflect the centrality of water for life. They also need to include other ecosystems and values besides those pertaining to WDE and their ecological values.*
1.2	a.	*Explicit reference to ethical principles should be provided. This could be achieved more easily if a* Water Centrality *Charter were adopted that is based on ethical principles.*
1.3	a.	*It is unclear if the policy is based on broad consent and who was involved in producing the document; 33 submissions that were received in the consultation phase indicate some dissent but also that feedback was sought, although it is unclear if this was a result of broad participation (see 2). Clarification of these issues should be provided.*

		Shortfalls → *Improvements*
2		**Participation and Voice**
2.1	a.	*It would be useful to clarify the extent and nature of public involvement. Reference to a public participation policy (if this exists) would be useful. More explicit description of potential stakeholder groups and how their involvement is ensured would be advantageous. Specific, and traditionally disadvantaged or disregarded groups, such as women and youth, as well as non-human life forms should be explicitly mentioned so they do not get neglected or overlooked.*
	b.	*There is recognition of diverse and changing values, which will be addressed through review of water allocations and EWP, but some more detail on how the review process ensures that changing values are considered would be helpful.*
2.1.1	a.	*The EWP policy does not make any reference to Human Rights, including freedom of association and speech. It is unclear what the exact situation is in Australia since the Convention of Human Rights has not been translated into law. This may need to be addressed in a different forum.*
	b.	*The mention of a selection of participatory methods is not sufficient without reference to this being tailored to those people's needs and the provision of training if necessary.*
2.1.2	a.	*Participation of decision makers should be ensured through the policy, assuming that implementation is occurring as stated.*
3		**Equity and Fairness**
3.1	a.	*Equity with regard to ecological conditions for life should be considered in the policy while the scope of the policy should be broadened (see also 1.1.a-c).The major shortfall is the restriction to WDE, while the process seems adequate (at least within the present accepted context; there are issues with the adequacy of the EIA process that need to be tackled elsewhere).*
	b.	*The central role for water for ecological conditions is not mentioned, only for WDE. Hence, the policy needs to be broadened to include indirect water dependencies, other parts of the water cycle and ecosystem services (see 3.1.a)*
3.1.1	a.	*Opportunity to improve wellbeing is not part of the policy except for water dependent ecosystems. As mentioned previously, it may be useful to either broaden the scope of the policy (see 1.1) or tie it in with a broader framework that takes care of these aspects.*
3.1.2	a.	*Poverty, human rights and access to services are not part of the policy directly, although they may be implied in certain elements, such as access to stock water; however more explicit reference to these aspects would be useful, see 3.1.1.a.*
	b.	*See 3.1.2.a. None of these considerations, either directly or through reference are related to water, but this is necessary for a water central water policy.*
4		**Integration and Coherency**
4.1	a.	*The whole system is not reviewed nor is reference made to a review that has taken place elsewhere.* → *A review of the whole water system should be conducted for WA, or even better for the whole of Australia, so that not only this policy but other policies, processes, legislation and decisions in general have a base for referral. This needs to be done only once and can then be used where appropriate. Review of the whole water system review will have to be ongoing as new knowledge comes to light.*
	b.	*The existing reference to the central role of water for WDE may be sufficient if the whole system context were established by reference to the whole water system review (see 2.1.a).*
	c.	*The implications need to be broadened from the primarily localised context and the focus on mainly blue water to include other water cycles including vapour, soil water and global elements.*

		Shortfalls → Improvements
	d.	*The existing reference to some social, economic and environmental aspects with regard to WDE only is insufficient. Provision should be made for wider exploration of interdependencies and connections of water to include those of indirect dependencies and ecosystem services.*
	e.	*It appears that provisions for knowledge improvement with regard to WDE are addressed sufficiently, but whole water system aspects need to be improved and could be addressed in association with a review of the whole water system (see 2.1.a).*
4.1.1	a.	*Broader consideration of the wellbeing and change components of the ecological system other than WDE is needed, e.g. those that depend on water indirectly.*
	b.	*Broader coverage of social issues is needed and should include indirect uses (see Chapter 2).* *Since social aspects are so interconnected with the water system they should be included as a matter of course in all decisions to ensure* Water Centrality *outcomes. This should be reflected in the policy.*
	c.	*The economic subsystem is neglected in the policy and needs to be included explicitly and in more detail since it has such a large effect on water allocation.*
	d.	*The part of the policy that refers to interactions of the subsystems needs clarification especially with regard to how economic aspects are included in decision making. Provisions also need to be made for a much broader exploration of interactions between all three subsystems to identify arising trends, opportunities and threats.*
4.1.2	a.	*A much clearer and more complete outline of both monetary and non-monetary values of water is needed to provide a fuller picture of the existing situation.*
4.1.3	a.	*The policy should include indirect ecosystem services more fully to be better aligned with the NSESD (1992) and should show the central role that water plays in all of them.*
	b.	*Economic activities and consumptive uses of water need to be treated more explicitly and their contribution to human wellbeing needs to be outlined in detail.*
	c.	*Reference to non-market activities need to be broadened considerably, especially with regard to the more indirect uses of water that contribute to human wellbeing, such as those relating to physical and mental health and spirituality.*
	d.	*The interactions of ecosystem services and economic and non-economic values of water (see 4.2.3.a-c) are considered only to a very limited extent and should be broadened considerably to allow for better consideration of interactions and their effects in planning and management.*
	e.	*All elements (4.2.3.a-d), also the social and economic aspects, should ideally be considered at all spatial levels (local to global), or at least provisions made to allow for this to occur, to ascertain if all levels are needed or affected and to what extent.*
4.1.4	a.	*Timeframes are set to deal with implementation and administration but have little to do with water cycles. Better exploration of all water cycles and their associated time frames is needed which should be reflected in the policy as well as in water plans.*
	b.	*Although references are made to future generations (s.2.3) and also sustainability, which is referred to throughout the document, a more specific outline of timeframes would be useful with regard to planning.*
	c.	*The time scales of 5 and 7 years mentioned in the document seem to be appropriate to short-term decision making, and changes in conditions may also be dealt with at any time.*
4.1.5	a.	*Long-distance influences will need some greater consideration since the policy does include local to regional scales but does not even set a state-wide scale, let*

		Shortfalls → Improvements
		alone national or global considerations. This need to be remedied so that long-distance and cross-scale effects can be ascertained and addressed.
4.1.6	b.	*A clearer explanation of what types of heritage are to be included in EWP assessments would be useful. Ideally, the full range of heritage types (see 'Expectations') should be included for a thorough treatment of issues.*
	c.	*The current conditions of the water system may have to be broadened to include other considerations besides those relevant to WDE (see 1.1 a-c).*
	d.	*It is unclear to what extent alternatives and different possibilities are explored, e.g. in water plans, allocation decisions or the EWP process. Provisions should be made for the exploration of all options to allow for better informed decisions.*
4.1.7	a.	*It is unclear how the proposed holistic approach is linked to the vision and goals and if it is a suitable framework to link indicators and assessment criteria to the vision. This should be made explicit. It may be useful to provide a separate section or document on this for use in water plans that include the considerations in 4.2.7.1 to 4.2.7.4.*
	b.	*The holistic approach proposed only refers to in stream flows and should be broadened to be useful for the whole water system.*
4.1.7.1	a.	*A limited number of key issues are used for analysis of ecological and social values; if anything, more key issues are needed to broaden the scope, especially with regard to economic aspects.*
	b.	*Key issues relate to water but would need to be broadened to cover other relevant areas of the water system besides social and ecological values.*
4.1.7.2	a.	*Indicators are not mentioned in the policy, and although details may not be necessary at the policy level broad guidance should be provided for use of indicators in water resource management plans (see also 4.2.8), so that progress towards* Water Centrality *can be assessed.*
4.1.7.3	a.	*For the sake of clarity it may be useful to specify relevant standard measurements for use in plans for ease of comparison.*
	b.	*Such measurements should be relevant to the aspect of the water system under consideration.*
4.1.7.4	a.	*Some guidance should be provided on comparing indicator values to targets for consideration in water and allocation plans.*
	b.	*Target values should be chosen to be relevant for the part of the water system to be assessed.*
4.1.8	a.	*Although it may be not the role of a policy to be descriptive on the use of specific indicators, some guidance should be provided on the appropriate use of indicators in the water plans, so that they are of interest to decision makers. Preferably, this should be done in a separate document to ensure consistency and for use elsewhere.*
	b.	*All this information drawn from indicators should be related to water, particularly in those cases where the connection is indirect.*
4.2	a.	*The policy clearly identifies all relevant documents, agreements and legislation that relate to provision of water for the environment and establishes its concurrence with those (s.1).* *Coherency and consistency are ensured and generally the links are made clear and are easy to understand. However, this does not ensure that the increasing complexity of water resource issues is taken into account since the other documents may not recognise these either. Also, the policy context is quite narrow (see 1&3), so the complexity of water resources needs to be made more explicit. It is not clear how the increasing complexities of water resource issues are accommodated, although review processes that take new developments into account are provided for (p.5).*

		Shortfalls → Improvements
5		**Ongoing Responsiveness and Efficiency**
5.1	a.	*More details should be provided with regard to potential stakeholders, who they might be and how it can be ensured that nobody is disadvantaged in any of the processes or institutional arrangements. Water (cycles) should be considered the prime stakeholder as a matter of course and be well represented.*
	b.	*It appears that institutional processes are responsive to change and uncertainty allowing for review when new information comes to light. However, the policy is a little vague with regard to monitoring of EWP and allocation licenses and more specific information with regard to what constitutes a case for monitoring or review would be useful, so that it can be included in water plans from the start. Care should be taken that all important changes in the water system, direct and indirect ones, are accounted for.*
5.1.1	a.	*The capacity to determine trends should be given through the prescribed monitoring; possibly some more detail with regard to monitoring responsibilities, capacity and reporting would be helpful (who has to do what, how and what triggers which response). This could be included in a separate document as that suggested in 4.1.8a.*
	b.	*Both direct and indirect measurements that are related to the water system should be included.*
5.1.2	a.	*There should be some reference to performance requirements or review of the Commission, or if this is presented elsewhere, e.g. the RIWI Act, then this should be stated. Such performance review should assess progress toward Water Centrality.*
	b.	*It appears that goals, frameworks and indicators are adjustable in light of new insights at any time, as long as the changes are minor. It is not clear what happens with regard to major changes outside the prescribed timeframes and also with regard to processes; details should be given on those aspects. It should be ensured that new knowledge is related to water, directly and indirectly.*
5.1.3	a.	*It appears that there is no feedback encouraged on decision making, and more detail should be provided. If the opportunity for feedback on decisions is not given this should be rectified, ensuring that particular attention is paid to water.*
5.2	a.	*More information regarding collective learning is required since detail is lacking. At present learning seems to be limited to research and consultation. If collective learning is not envisaged this needs to be rectified especially with regard to government-community partnerships.*
	b.	*Such collective learning should highlight relationships and connections with water to help raise awareness and progress Water Centrality.*
5.2.1	a.	*The focus of knowledge improvement is very narrow only concerning "water regime requirements of significant ecosystems within Western Australia" (s.2.4[6]) and needs to be broadened to include community. It may be helpful to indicate how other forms of knowledge besides research are encouraged.*
	b.	*Knowledge should be sought more widely in accordance with 1.1 and be related to water in all its forms and to all values.*
5.3	a.	*With regard to the determination of EWPs of GDEs ecological effectiveness seems generally ensured, but this scope should be broadened to include other ecosystems and other relevant aspects of the water system (see 1.1 and 3.1).* *With regard to economic efficiency, no information is provided but this may also be beyond the scope of the policy, in which case appropriate reference to other documents or avenues is necessary.*

		Shortfalls → *Improvements*
6		**Institutional and Community[37] Capacity**
6.1	a.	*Generally, the policy advocates community involvement but not in the actual decision making process. Ongoing support in the decision making process may be beyond the scope of this policy but information to that effect should be made available for reference, possibly as a separate document if appropriate.*
	b.	*Any decision support should have water as a central concern.*
6.2	a.	*The policy does not provide any detail on institutional capacity. However, the commission had capacity to conduct its business although funding to conduct research and administration were limited. This situation may have changed now since at least a part of the original Commission has moved to the Department of Water (DoW), which appears to be well funded.*
	b.	*Institutional capacity should be appropriate for water but care should be taken that all forms and values of water are covered.*
6.3	a.	*The policy does not refer to institutional capacity building or renewal, and this may be beyond the scope of the policy, however, it would be useful to have a reference on how this is handled and what it entails, probably best published as a separate document that can be used for other relevant occasions and institutions. Institutional renewal has occurred with the formation of the new DoW and the policy may need updating to reflect these changes. Broader learning avenues that include the community and other players should be explored.*
	b.	*While the institutions to which the policy refers are dedicated to water any capacity building and renewal that occurs should ensure that all forms and values of water are accommodated.*
6.4	a.	*There is much scope for community capacity building and community development, which are not addressed in the policy but may aid in a better allocation process and minimise damage to ecosystems.*
6.4.1	a.	
	b.	*This should be clearly addressed in the policy since the community at large is the most influential agent in effecting change and protecting the ecological values envisaged in the policy. The whole water system should be kept in mind at all times.*
	c.	
	d.	
	e.	
	f.	
	g.	
6.5	a.	*Only 'blue' and groundwater in context of WDE are considered in the policy; green, virtual water and waste water are neglected as are the broader interconnections and implications. This should be rectified together with the broadening of the policy (see 1.1 and 3.1).*
7		**Transparency, Accessibility and Accountability**
7.1	a.	*There may be improvements possible with regard to information distribution but this is a much larger issue and beyond the scope of this policy. Overall, it appears that information is easily obtainable and at least the major decisions are distributed through the media.*
	b.	*While the information contained in the policy concerns water, it is relevant to only a small part of the water system. A broader context or reference to a document that provides this (e.g. as outlined in 4.1) may be useful.*
7.1.1	a.	*As long as an interested person is literate and knows where to look, information should be accessible and available. With regard to understandability and format, no information is given but some form of general reference or guidelines would be*

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[37] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others (Adams & Hess, 2001).

		Shortfalls → Improvements
		useful, although this may be beyond the scope of the policy.
7.1.2	a.	*Although there is a commitment to transparency more detail needs to be provided about what this means and what it entails. Overall, clearer description of processes is needed in some areas, especially with regard to consideration of economic aspects and decision making processes. The options for public scrutiny seem limited and should be expanded.*
	b.	*Water is considered in all processes and decisions, but the scope of the policy, or at least its reference or context, should be broadened to include the whole water system.*
7.1.3	a.	*The policy needs to provide information regarding judgements and assumptions; how are judgements made and what are the assumptions used in decisions? If this is too much detail a more general reference to how these aspects are dealt with is needed. All judgements and assumptions should take into account the actual and potential effects on the water system.*
7.2	a.	*Overall, the document is quite user friendly and understandable (see also 7.2.1). The relevant processes are described although more detail on how decisions are arrived by should be provided. Institutional design is not addressed and may be outside the policy's scope (a separate document for referral may be useful).*
	b.	*While the document and described processes cater for water, the institution itself may need to be assessed for its set-up. The physically as well as conceptually the processes and physical elements, including building, should cater for water and use it as a role model.*
7.2.1	a.	*Overall, the document is easy to read and understand; jargon is kept to a minimum and explained in the glossary. Some of the essential information from the appendices could be included in the main body or referred to better. A better numbering system for paragraphs may be useful for easier referral. Water metaphors could be used to emphasise the nature of the policy and aid in spreading water awareness.*
7.3	a.	*No reference to accountability is made. This may be outside the scope of the policy but this information should be available somewhere and needs to be referred to in the policy. Accountability should also be to the water system.*
7.4	a.	*Responsibilities of the major players are all clearly assigned.*

There are two major issues apparent in the document with regard to *Water Centrality*. First, the policy generally fulfils its mandate although there are also shortfalls in that regard. The second, and major, issue is that the overall context is too narrow, requiring much broader changes that go beyond the policy itself. All the values of water, their interconnections and the whole water system should be used as a reference base.

Generally, the document is well structured and easy to understand although there could be better paragraph numbering and cross-referencing to important information that is contained in appendices or in other documents. More attention should be given to: consideration of broader social issues including indirect ones; more explicit description of economic aspects, monetary and non-monetary values and non-market

activities and their consideration in decision-making; equity, which should feature more explicitly; reference to ethical principles; clarification of processes especially with regard to decision-making and consideration of economic aspects; and explicit outline of judgements and assumptions.

The primary policy objective and goals, and with it the whole policy, should be broadened or at least make reference to, or be placed in context with, the whole water system and acknowledge the primary importance of water for life. It should also include other ecosystems and considerations besides those that pertain to WDE and acknowledge the increasing complexity of water issues. Since the EWP policy and the WRC are closely connected with other policies, initiatives and legislation, it may be necessary to review and amend those in the first place, especially those that are aimed at a higher level than the EWP policy.

The State Water Plan (Government of Western Australia, 2007) has a broader outlook and acknowledges the importance of water for life, the economy, the environment and communities. It also provides an overview of water availability and use in the state context in which the EWP policy should be placed. This overview seems quite comprehensive but contains mainly the quantitative and spatial aspects of water availability and use, whereas the water cycle time frames are mostly addressed in conjunction with climate change. There is limited coverage of interconnectivities and interdependencies, which, if broadened, would make addressing these aspects in policies and other documents easier and more consistent and relevant. An augmented review should ideally be published as a separate document so that it can be easily identified for what it is and referred to in compiling other policies and documents. It should be linked to an Australia-wide water system review (document), which is yet to be forthcoming.

Broader consent and support for the policy should be aimed for and could probably be achieved through better participatory and feedback processes. This may need to include better flow of communication and information dissemination. It would be useful to be more explicit about potential stakeholders so that the involvement of traditionally disadvantaged groups is ensured. It should be explained how this can be done and how the capability of all stakeholders can be supported and enhanced, although this may better be done in a separate procedural policy.

Other separate guidance documents or policies should be provided to support and augment this one with regard to institutional and community capacity building, community involvement, knowledge seeking, decision-making and economic efficiency as well as funding. Another that outlines the use of indicators and their reference values as well as trend directions, etc. would be valuable for the preparation of WRM plans.

More adaptiveness would ensure that changing circumstances and values can be accommodated more easily. This requires more detail with regard to monitoring and review, including agency capacity, performance requirements and consequences of non-compliance. Feedback on decisions should be encouraged and collective learning initiated and supported. Knowledge improvement needs to be broadened to reflect the larger context and should include traditional and community knowledge besides the scientific forms. Details on how this can be done should be provided.

Even if *Water Centrality* were not a concern, the policy would have to be questioned on a number of its elements, particularly decision-making and procedural issues regarding the lack of detail about economic aspects in arriving at EWP. It has been more than five years since the policy was written, so a review of the policy may be warranted. This is even timelier now that the Water and Rivers Commission has been subsumed by the Department of Water, responsibilities may have been reassigned and many other changes, administrative and otherwise, are under way.

The AMOEBA in Figure 7.2 highlights the overall lack of compliance of the EWP policy in relation to *Water Centrality*. Five of the seven principles only achieve a level two rating while Principles 2 and 7 reached a 'good' mark.
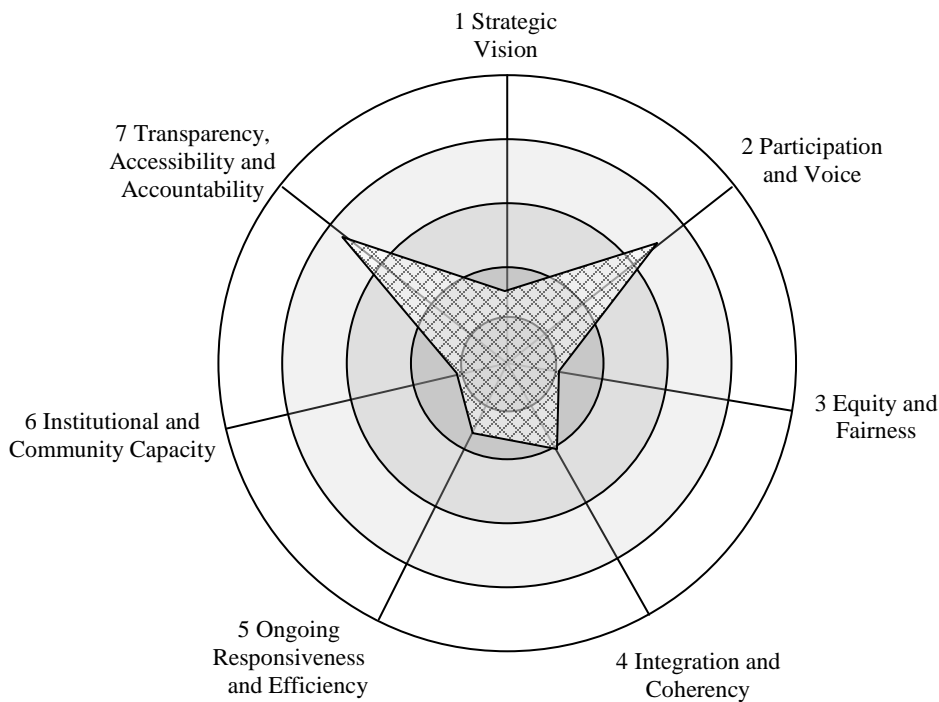
Figure 7.2: AMOEBA for the *Water Centrality* Assessment of the *WA EWP Policy* (Water and Rivers Commission, 2000)

In summary, although the major issues concerning the EWP policy with regard to *Water Centrality* are of a more fundamental nature that need addressing at the state (and national) level there are also concerns that relate directly to the policy that should be addressed to ensure it fulfils its mandate sufficiently. Overall, the policy will need a major overhaul or complete replacement in order to be water central.

7.1.3 Case Study 3: Infancy to Young Adulthood: A Mental Health Policy for Western Australia (Department of Health, 2001)

Infancy to Young Adulthood: A Mental Health Policy for Western Australia (Department of Health, 2001) focuses on the provision of mental health services for infants, children and young people including their families. It is part of the commitment to mental health services reform by the states under the *National Mental Health Strategy*. It also ties in with the Western Australian Department of Health strategies and the *State Health Plan* and was written in response to the *Health 2020* report by the Ministerial Taskforce on Mental Health that was published in 1996 (Department of Health, 2001).

The 40-page document includes an introduction and extensive background information about youth mental health issues in Western Australia, including statistics. It has a table of contents and its structure is based on the strategic directions that are outlined in detail. There are two detailed appendices.

The policy is based on extensive consultation within the Department of Health, with health professionals and affected families (Department of Health, 2001). It is a strategic policy that is quite detailed as would be expected from a state level policy on a specialist subject.

Table 7.3: WCI Application to *'Infancy to Young Adulthood': A Mental Health Policy for Western Australia* (Department of Health, 2001) (last column only; for full application see Appendix D; please use *Waterbookmark* as reference to the WCP)

		Shortfalls → Improvements
1		**Strategic Vision**
1.1	a.	*No overall vision statement is provided; content in the foreword and the introduction could be amalgamated to form a vision, which would be useful to clearly show the intentions of the policy and make them easily accessible.*
	b.	*A vision should reflect the importance of water for life; in this case it could highlight the importance for mental health, in a physical as well as mental and emotional context.*
	c.	*The objectives should reflect the centrality of water and could highlight the potential role of water in the prevention and treatment of mental disorders.*
1.2	a.	*Ethical principles could be made more explicit, e.g. reference to the* Convention on the Rights of the Child (Office of the United Nations High Commissioner for Human Rights, 1998) *could be made.*
1.3	a.	*There appears to be some form of consensus within the mental health services area although this would need verification outside of this document. The level of agreement within the broader community and service users seems more tenuous although the intention to include all involved parties could potentially go a long way towards consensus, if implemented.*
2		**Participation and Voice**
2.1	a.	*The intention to include all relevant stakeholders is made explicit. Actual implementation remains to be seen with little reference how this could be done or operationalised (although this may not be a role of this policy but rather identified in the regional plans that are provided for).*
	b.	*Diverse values are well recognised and included in service delivery, particularly for indigenous people and people with CALD[38]. It remains to be seen what the proposed DoH transcultural mental health policy will bring to judge how changes will be accommodated.*
2.1.1	a.	*Freedom of association and speech may be implicit in Australia although there may be situations relevant to this policy in which these and other Human Rights may need clarification*
	b.	*The policy seems to address issues of cultural and other disadvantages of potential patients and carers as well as aiming to increase knowledge and awareness of mental health issues. While issues of access to services and cultural hurdles are addressed other elements such as literacy or access to online information is not addressed, which should be remedied.*
2.1.2	a.	*The intention of the policy to include decision makers at all levels of service provision seems clear.*

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[38] Children from culturally and linguistically diverse backgrounds.

3		**Equity and Fairness**
3.1	a.	*The role of ecological conditions for mental health may not be obvious but a functioning environment and ecology are essential for human health and wellbeing, which should be acknowledged. Given the prevalence of drought and farmland salinity in Australia, special provisions may need to be made for people living in areas that experience such conditions to help ameliorate the negative impacts on wellbeing and mental health.*
	b.	*The central role of water in maintaining ecological conditions should be made obvious, highlighting the mental health issues associated with drought and farmland salinity conditions in particular.*
3.1.1	a.	*Access to water may not be an obvious concern for the policy but the role of water and access to it should be explored in the context of mental health, particularly with regard to the rural population experiencing drought and farmland salinity conditions and aboriginal people who experience a loss of health associated with environmental and cultural impacts on 'country'.*
3.1.2	a.	*While intra-generational equity in terms of service access is well considered in the policy and anticipatory measures are taken for future service delivery issues such as resource use and access, water quality, pollution, poverty, over-consumption, human rights are not addressed. While some of these issues may have limited and indirect relevance these connections should be explored.*
	a.	*The considerations of 3.2.1.a are not related to water but should be explored in that context to ascertain the connections with mental health.*
4		**Integration and Coherency**
4.1	a.	*It could be advantageous to have a review of the existing mental health care system, although ideally this should have been done in preparation for the policy. The description of the 4-tiered system of mental health care for youth provides a good basis from which the whole system could be explored. It would be advantageous to represent the system in form of a conceptual model that shows clearly the different levels of care providers and their interactions so that it is easily understood and accessible to providers, administrators and care recipients and their carers alike. The connections between the different policies that are interrelated on a state and national level should be shown more explicitly.* *The various regional plans could then refer to and be put into the appropriate context with the review.* *The connections to water should be made explicit in this model and review, and the connections to the whole water system model (in cases where such model has been produced) should be made clear. The connection of mental health and the values of water should be made explicit.*
	b.	*The central role of water should be made explicit for the youth mental health system and its parts. The values of water could be used as a guide, especially those pertaining to physical and mental health.*
	c.	*Water cycles are not considered but should be explored for their relevance for mental health.*
	d.	*The interdependencies and connections of water with mental health are not considered but this should be remedied to tie in the mental health system with the water system.*
	e.	*The gaps in knowledge about the youth mental health system seem to be reasonably well known and measures are envisaged to address these.*
4.1.1	a.	*Considering geographic elements in regional plans is important but the broader ecological subsystem should be considered, especially given the progressively emerging insights about connections of human and ecological health, biophysically as well as mentally and emotionally.*

		Shortfalls → Improvements
	b.	*The policy has a social service focus aimed at redressing shortcomings of the existing youth mental health system. This includes how previously disadvantaged groups, i.e. indigenous people and CALD, can be better included and how services to rural and remote areas can be improved. While the state of the system and the direction of change seem to be well-considered information on the rate of change is sketchy. None of these considerations are related to water. Changes to the policy should include timing of changes and make connections to water obvious.*
	c.	*While improvements to funding and resource levels of service provision and training are under way, there is little reference to socio-economic factors that affect patients and how they will be dealt with, although this may be the role of the regional plans. More emphasis could be placed on economic aspects relating to service recipients and the influences on mental health, need for services and service delivery. Overall, connections to water should be made clear.*
	d.	*There is a lack of consideration of interconnections beyond the recognition that appropriate funding is needed for adequate service delivery and staff training. The interconnection between ecological, social and economic elements should be explored beyond these insights and connections made with water; e.g. there may be effects on mental health and the mental health system through shortages in water, increasing water costs and climate change.*
4.1.2	a.	*The values of water should be identified and their costs and benefits to mental health highlighted.*
4.1.3	a.	*The ecosystem services of water may be indirect and obscure with regard to mental health but they should be clarified to enable consideration of the broader context.*
	b.	*Similar to 4.1.3.a the context of economic activities that contribute to human wellbeing and their connections to water may be obscure but could be important for mental health and should be explored. This could include payment for services, building of facilities and instruments and activities of the pharmaceutical industry.*
	c.	*The policy is limited to activities within the (mental) health system and should be broadened to a wider social and relational context (e.g. neighbourhoods, living conditions) and highlight the role of water.*
	d.	*The interactions of 4.1.3.a to c are not considered but should be explored to obtain a broader view and identify any confining or enhancing interactions.*
	e.	*The local, regional, state and national contexts are considered however, the global context is missing, which should be remedied.*
4.1.4	a.	*Time frames should be made more specific and be matched with water system time scales.*
	b.	*The time frames of the policy should be expanded to beyond the next generation.*
	c.	*Time scales seem appropriate for short-term decision making although this could be made more explicit.*
4.1.5	a.	*The spatial frames of reference range from local to national but no reference is made to the water system and any impacts on it (see 4.1.3)*
4.1.6	a.	*The policy arose in part as a result of a Ministerial Taskforce that reviewed the mental health system, hence, historic conditions regarding resources and facilities, as well as administration are considered. However, influences on future conditions of water are not examined and should be explored.*
	b.	*Current water systems are not considered in any planning but should be included.*
	c.	*The suggested strategy may be the best available but there is no reference to an exploration of other options. It should be made apparent where the current proposal originated and what other options were explored and why they were discarded. All possibilities should be examined.*
4.1.7	a.	*The Service Provider Guidelines for Child and Adolescent Mental Health Services*

		Shortfalls → Improvements
		(CAMHS) in Western Australia *that are based on the* National Standards for Mental Health *may help afford consistency in health care provision, however, it should be mentioned how these are linked to the objectives of the policy and if these standards will be used in evaluation and how. It should also be explained how the suggested tiered system for mental health service provision is linked to assessment.*
	b.	*It should also be explored how the guidelines are related to water, explaining particularly the less obvious relationships.*
4.1.7.1	a.	*The number of key issues for evaluation seems limited and very broad. Some more detail would be useful although this may be provided in the CAMHS and should be stated if that is the case.*
	b.	*Relationship of these key issues to water and* Water Centrality *should be highlighted.*
4.1.7.2	a.	*See 4.1.7a and b. Details on indicators or where they are outlined should be provided and reference made to* Water Centrality.
4.1.7.3	a.	*The importance of standardised measures is recognised and envisaged for implementation; a check if these measures are sufficient should be undertaken.*
	b.	*Measurements should be related to water wherever possible and meaningful.*
4.1.7.4	a.	*The policy should make reference to targets. If there are targets in a relevant document elsewhere this should be mentioned.*
	b.	*These targets should relate to the water system, even if only indirect connections are possible.*
4.1.8	a.	*Evaluation regarding outcomes for service recipients, service delivery and macro policy should be suitable to engage decision makers, although it is not quite clear how interest in the outcomes will be achieved beyond the policy intentions. Reference should be made to indicators or tools that might be suitable.*
	b.	*While the connections to water are mainly indirect, these should be taken into consideration when choosing indicators.*
4.2	a.	*Increasing complexity of water issues is not considered in the policy but should be included.*
5		**Ongoing Responsiveness and Efficiency**
5.1	a.	*The policy envisages that processes and institutions are adjusted to better serve all stakeholders and that they are included in key processes in the system. Water should be included as a stakeholder.*
	b.	*Flexible models of service delivery and ongoing quality improvement are outlined, while capacity for expansion and change is planned for services and facilities. There could be more detail about how uncertainty is being dealt with. Also, all forms and values of water should be considered.*
5.1.1	a.	*There is provision for systematic data collection and feedback, but more detail should be provided about the nature of the data and the frequency of their collection. It should be made clear if the CAMHS provides such detail.*
	b.	*Measurements should also be able to show effects, even if they are only indirect, on the water system.*
5.1.2	a.	*Ongoing performance review is provided for with the aim of ongoing quality improvement, however, there should be more detail on the type of performance measures used. It should be made clear if the* CAMHS *provides for this. Performance review should also relate to progress in* Water Centrality.
	b.	*The document should outline review or adjustment processes in case of new insights and emergence of knowledge. While reference to continuous quality improvement and dissemination of research outcomes is made, the detail could be improved, or reference made to plans or other documents that provide details, e.g. the CAMHS. Review and adjustments should also take water into account as a*

		Shortfalls → *Improvements*
		matter of course.
5.1.3	a.	*Involvement of consumers in policy making, planning, priority setting and evaluation as envisioned in the policy may allow for feedback on decision making but this should be described more clearly. Water should be considered throughout.*
5.2	a.	*Collaboration in setting the research agenda is a good basis for collective learning but should be supported by more than dissemination of educational material and research findings. Further collaboration in other areas and with other participants should be explored.*
	a.	*Collective learning should include issues of water and its relationships and connections to mental health and health care.*
5.2.1	a.	*Commitment to ongoing search for knowledge is supported, especially through research and involvement of traditional indigenous healers.*
	b.	*There should be an ongoing search for water knowledge related to mental health, direct and indirect aspects.*
5.3	a.	*While rational decision making is highlighted for resource allocation the policy should also include other economic elements, ecological concerns and issues of water system function, which are not addressed.*
6		**Institutional and Community[39] Capacity**
6.1	a.	*Decision making support is provided at several levels. Families are provided with appropriate educational information; ongoing data collection allows for feedback that can be used in decision making for service quality and effectiveness; increased training and support assists service providers in client-related decision making.*
	b.	*All these aspects should be related to water and include consideration of water.*
6.2	a.	*While data collection, recording, interpretation and feedback are specified, clarification is required on the provision of institutional capacity to do so. In addition, details should be provided on who is responsible for documenting and auditing these records and how this is done. Reference to the CAMHS should be made if this is appropriate.*
	b.	*All these elements need to be related to water and be designed with water in mind.*
6.3	a.	*While service quality improvement mechanisms are outlined that refer to research, knowledge and education of service providers (see also 5.2 and 5.2.1) as well as facilities, clarity could be improved regarding some of these measures, which appear to be once-off rather than ongoing. There should also be details on ongoing capacity building, modernisation and renewal of the DoH itself.*
	b.	*Any institutional capacity building or renewal measures should ensure that water is considered.*
6.4	a.	*Community capacity building may be inherent in the formation of effective partnerships with families and communities that is part of the State* Mental Health Promotion and Illness Prevention Strategy, *which is referred to in the policy but without details. Provision of educational material for young people, families and the broader community are intended to increase knowledge and awareness and provide decision support.*
6.4.1	a.	*Issues of community leadership and skills development and provision of resources for community development should be addressed.*
	b.	*See 6.4.a.*
	c.	*See 6.4.a.*

[39] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others (Adams & Hess, 2001).

		Shortfalls ➔ Improvements
	d.	*While the integrated system of mental health services is outlined well and in detail, the nature of partnerships with families and consumers at the system level should be specified.*
	e.	*Yes, there is intention to increase decision-making power through education and by provision of better emergency services. This could be broadened and increase in self-esteem and confidence could be supported more explicitly.*
	f.	*Reducing the stigma surrounding mental health may be useful in promoting a sense of community, although the latter is not specifically pursued by the policy.*
	g.	*Any community development and capacity building should ensure that water is considered.*
6.5	a.	*Although institutions related to youth mental health are not specifically set up to deal with water in any form (except for that used in their premises by employees), they should be able to deal with some of the values of water such as those related to physical and mental health and perhaps take responsibility for water pollution caused by prescription of pharmaceuticals. Broader concerns of livelihood and water shortages, as well as climate change, that all depend on water should also be considered, at least insofar as they can have effects on mental health.*
7		**Transparency, Accessibility and Accountability**
7.1	a.	*Information on mental health promotion and illness prevention is intended for the whole community while improved access to specialist information is envisaged for service providers throughout the country including remote areas. Presumably, this information is distributed freely, but this could be clarified.*
	b.	*Information on water, its relationships to mental health and* vice versa *should be made available to foster water literacy.*
7.1.1	a.	*The aim of the policy is to improve access to services and information to all those who want and need it. Data and feedback is provided in appropriate form to all interested parties.*
7.1.2	a.	*The policy could be clearer about how transparency and openness of processes and decision making is ensured. This includes the outlined family involvement in planning, priority setting and system evaluation, provision of feedback on data collected for the purposes of quality assurance (in this case the data is interpreted and presented in appropriate form, which should be clarified) and funding transparency. Many processes that are alluded to should be specified or reference made to where the appropriate information can be found.*
	b.	*All processes and decisions should take water into account; various forms of decision support may be thinkable, e.g. a set of questions or a short version of the WCI.*
7.1.3	a.	*More detail should be provided on how the outcome measurement data that are collected are scored and interpreted before feedback is provided to stakeholders. If the CAMHS provides these details it should be mentioned.* *Some detail about how judgements, assumptions and uncertainties are dealt with and how effects on the water system are considered should be provided.*
7.2	a.	*Much of the policy outlines changes to the youth mental health system that are aimed at improving the processes, capacities and facilities of the system with users and clients in mind. Educational documents as well as feedback on outcome measures are supposed to be designed for different users. While the intentions seem to indicate that documents, processes and institutions should be user friendly, accessible and relevant this would need to be verified in practice.*
	b.	*All institutions and processes should be designed with water in mind, conceptually and physically.*
7.2.1	a.	*The document could be improved with a better structure, use of dot point lists and tables, diagrams and cross-referencing. A summary of the CAMHS would be*

		Shortfalls → Improvements
		advantageous. *The language is clear and plain with little jargon used, but could use more water metaphors to emphasise the centrality of water for mental health.*
7.3	a.	*Although evaluation is stipulated as part of service provision and continual quality improvement, accountability is only specified for programme providers in terms of resources. More information should be provided on how quality improvements are ensured and shortcomings are addressed, and how this is done for all the forms and values of water.*
7.4	a.	*Responsibilities are clearly assigned or should be in the regional plans, but water is completely neglected. This should be remedied to ensure that water is looked after in the best possible way.*

It is evident that water is not mentioned at all in the policy. This is not surprising since water is at present rarely brought into context with mental health. It is also apparent that the social aspects are covered most thoroughly, as would be expected in the context of mental health, and that the economic elements are also considered explicitly, but that environmental concerns are virtually not taken into account. While mental health provision is foremost a social and economic issue, the neglect of environmental concerns would need to be rectified if the policy were aspiring to achieve *Water Centrality* compliance. In addition, the lack of consideration of water would be the major issue to be addressed.

On the surface, the policy seems well structured, but on closer inspection background information is used for explanatory or justification purposes throughout the body of the policy, distracting from the actual policy content. Conversely, while reference is made in the policy to a mapping exercise of mental health requirements in WA there is little information available about the outcomes of the exercise. It is also unclear what prompted the exercise, who was involved in it and where the outcomes are available, as a publication or otherwise, although such information could possibly enrich the background and rationale of the policy.

Better use of dot points and lists of issues or suggested approaches could improve the clarity of the document and also facilitate and simplify the evaluation of achievement of policy content in a potential review later. No provision is made for a review of the policy and it remains unclear in places how the policy content will be translated into practice. Admittedly, this may not be the role of the policy rather that of the subsequent regional plans, but in some cases more detail would be helpful, also to guide the production of regional plans (possibly in the form of a separate guidance document).

While improvement of youth mental health services is encouraged through ongoing collection of data, their analysis and provision of feedback, and although community participation in policy making, planning, priority setting and evaluation is envisaged, the policy is not fully convincing in conveying a participatory approach to youth mental health. This is in part due to the way the policy is worded in the sections that refer to participation and the lack of details of how this would be achieved.

At first glance, many of the questions referring to water seem to be misplaced in the context of mental health, but closer examination reveals that there are many connections that are generally not expressed, explored or made obvious. These range from the consequences of physiological effects of water, or a lack thereof, on and in the human body, including the potential effects of polluted water, to the effects of climate and environmental conditions on mental state and wellbeing.

For example, minor and chronic dehydration could contribute to mental health problems since dehydration has been found to affect mental function (Seymour, Henschke, Cape & Campbell, 1980) and during brain development can affect density of grey matter (Gogtay, Giedd, Lusk et al., 2004). Hence, dehydration could contribute to the emergence of mental diseases or cause symptoms that may be misdiagnosed as mental health conditions.

Other physical effects of water on health include spa treatments that have been successful in reducing lower back pain with associated gains in wellbeing and mental health (Constant et al., 1998). Hydrotherapy improved wellbeing in patients with rheumatoid arthritis (Eversden et al., 2007) and helped improve the condition of those with osteoarthritis of knees and hips (Silva et al., 2007). Considering the therapeutic effects of water treatments for people with dementia (Smith, 2003) there could be unexplored potential for therapeutic treatments for mental health patients and/or in the prevention of mental health conditions, particularly for young people, that may have advantages over more 'traditional' pharmaceutical treatments (e.g. fewer side-effects, lower cost, potential for self-administration).

There is also growing concern about residues of drugs in effluent even after treatment in sewage treatment plants (e.g. Boxall, 2004; Fent, Weston & Caminada, 2006; Zuccato, Castiglioni, Fanelli et al., 2006). In this context, the potential of such chemicals to affect mental health, directly and indirectly, should be explored. Another

requiring consideration may be the potential effects of drugs administered in the treatment of mental diseases on the water balance of the body.

The benefits of outdoor recreation or the view of greenery itself has been well established (Frumkin, 2001), and, obviously, water is an important factor in maintaining the 'green'. In a review of the literature on the role of nature on human health, many studies found a beneficial effect of scenes of nature on human wellbeing and health, including quicker recovery time from surgery, reduced stress levels in e.g. prisoners, workers and car drivers, reduction in illness and better test scores in people who had a view of nature as compared to those who were without one (Maller et al., 2006). Landscapes or green scenes, particularly those with water, real or depicted, were experienced as calming and stress reducing (Ulrich, 1995) and water itself as meditative (Strang, 2005).

These findings could play a role when considering the role of water and drought on mental health levels of rural populations, although other consequences of drought, such as financial hardship but also other social and emotional effects, including loss of social networks and experience of psychological poverty (Alston & Kent, 2004), all contribute (Albrecht, Sartore, Connor et al., 2007; Sartore, Stain, Kelly et al., 2005). Drought can be thought of as a natural disaster in chronic form with similar psychiatric consequences and is seen as a cause of the psychoterratic[40] condition of solastalgia – "the lived experience of the physical desolation of home" – described by Albrecht et al. (2007 p.s96). The same can be said for farmland salinity where the potential for people who live in affected areas to experience mental distress associated with solastalgia, financial pressures due to reduced profitability and loss of social networks can be heightened (Jardine, Speldewinde, Carver & Weinstein, 2007).

The limited recognition of the close link of the health and wellbeing of aboriginal people and 'country' (which includes both land and water) requires attention (Willis, Pearce & Jenkin, 2004), including the destruction of waterways as well as the destruction of places of cultural significance through water (e.g. through dams or other inundation).

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[40] "Psychoterratic illness is defined as earth-related mental illness where people's mental wellbeing (psyche) is threatened by the severing of 'healthy' links between themselves and their home/territory." (Albrecht et al., 2007 p.s95)

The linkages between climate and mental health may also warrant further investigation although the connections to water may be indirect through humidity and cloud formation (Anderson, 2001). An example would be Seasonal Affective Disorder that is connected to cloud cover (Magnusson & Boivin, 2003), another that humidity and heat cause stress that can result in aggressive and inappropriate behaviour (Simister & Cooper, 2005).

The concern that climate change may be "a globally significant source of psychoterratic distress expressed as nostalgia and solastalgia" (Albrecht et al., 2007 p.s98), may be related to the existing evidence that weather and weather conditions influence emotional states and mental health, e.g. evidence of increased violence in the warm season (Anderson, 2001; Braaf & Gilbert, 2007; Sivarajasingam, Corcoran, Jones, Ware & Shepherd, 2004) and influence of temperature on suicide rates (Lee, Lin, Tsai et al., 2006; Salib, Cortina-Borja & Anderson, 2007) or schizophrenia patients (Shiloh, Munitz, Stryjer & Weizman, 2007).

Although water, or its lack or contamination, would rarely be the sole cause for mental health conditions it should not be underestimated as a contributing factor to, but also in the prevention of, mental health problems. Given the widespread occurrence of drought and farmland salinity in Australia, the policy should make special provision for the rural population that experiences these circumstances to help ameliorate the impacts.

Assessment was hampered by limited familiarity with the youth mental health service system, which made it, in part, difficult to identify how the elements identified in the WCI were addressed by the policy. Also, while the policy was easy to read and overall well-structured, there were some difficulties with interpreting the meanings of several points. This was in part due to a lack of detail but also because some of the wording was ambiguous.

The AMOEBA for the youth mental health policy (Figure 7.3) shows for most of the principles a level of medium compliance (2.5 out of 5) or better. Both Principle 1 and Principle 3 are below satisfaction while, in contrast, Principle 2 achieves a 'good' to 'very good' rating. While this may seem puzzling since the policy does not address water at all, the results highlight that *Water Centrality* is a broad concept that incorporates many aspects that are not obviously related to water and its management.
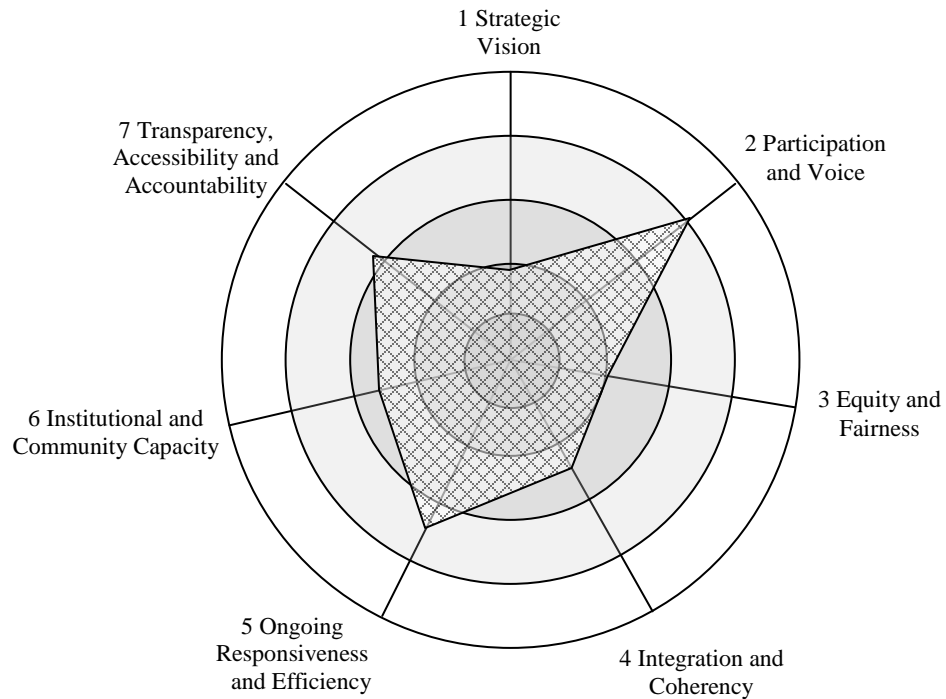
Figure 7.3: AMOEBA for the *Water Centrality* Assessment of the *'Infancy to Young Adulthood': A Mental Health Policy for Western Australia*

Overall, although the policy fulfils some of the *Water Centrality* requirements quite well, it would need considerable adjustments, especially in relation to the ecological and water elements in order to become *Water Centrality* compliant

7.2 Discussion

In reflecting on the application of the WCI in the three case studies there are two aspects that call for consideration; first, the WCI itself requires evaluation and, second, the outcomes of the WCI application need to be examined. Both are dealt with in separate sections below.

7.2.1 Reflections on the WCI Application Process

It was expected that many of the *Water Centrality* specific questions would not be answered affirmatively since *Water Centrality* is not yet a declared goal of society; but many of the questions that derive directly from sustainability, which is pursued in Australia, also could not be answered positively, or only partially, in all three cases. For the vast majority of assessment items, improvement had to be suggested, although there are differences in the extent to which this was necessary, depending on the level, breadth of scope and nature of the policy. However, it would be expected that once *Water Centrality* were implemented, and more policies and other documents were based on and incorporated *Water Centrality* Principles, the more questions could be answered in the affirmative and the less complex the WCI application would be.

Overall, though somewhat daunting at first, the application of the instrument was quite straightforward. Initially some of the questions may seem unclear to the (potential) reviewer(s), appearing unexpected or unrelated to the assessed item, but the instrument 'expectations' generally should give sufficient guidance. One of the hurdles has been the difference in terminology between the WCI and the assessed document that was overcome by thinking more broadly and adopting what could be called a 'thesaurus approach': looking for the equivalent meaning of a concept or idea in the document (e.g. 'intergenerational equity' is deemed equivalent to 'considering both present and future generations'). Caution should be exercised in inferring meaning and intentions from the wording of a document and it may be prudent to clarify meanings and agree on certain definitions, which should be made clear in the evaluation (and should find its way back into the assessed item itself to help with future interpretation).

Applying the WCI can be a tedious process, as it takes time. Obviously, the longer and more complex the assessable document and the less familiar the user is with it, and the WCI, the longer it will take. However, the advantage of someone applying the WCI who has limited familiarity with the assessed document may be a reduced preconception bias that is inevitable when having close familiarity with something. Preferably, someone who knows the document well should also be involved in the assessment so that lack of background knowledge does not become an issue. A group process may be best (see below).

In the present case, increasing familiarity with the instrument made application progressively easier with each assessment. The '*Waterbookmark*' was helpful as a

'map' and for cross-referencing, reducing the amount of paper shuffling or scrolling on the computer screen. It is recommended to use a computer to fill in the form since that way entries can be corrected or added to in a more efficient manner than on paper. If an electronic copy of the assessment item is available then material can be lifted out and placed into the WCI directly, saving time and reducing interpretation errors. However, it would be useful to have a paper copy of both the WCI and the assessment item to hand since it may make scanning for items of interest easier and quicker. Items can also be highlighted for easier retrieval.

Application can be unwieldy since there are times when a large amount of information that can be scattered throughout the document may be relevant to one point or question. Familiarity with a document has been found to increase rapidly through the assessment process, which increases the speed of progress but also bears the danger of overlooking relevant points. It was found best to 'review' the assessment by repeating the process (after a break) to ensure that all relevant issues were covered and nothing was overlooked. Fatigue has to be taken into account and addressed through appropriate measures, e.g. regular exercise and meal breaks.

There are also some questions that overlap in the WCI and although this can be addressed through cross-referencing, difficulties arise as to what applies or belongs to which question. This may make finding the key elements problematic, especially in group situations, where a scoping exercise may be useful to identify the 'big issues' and define their boundaries. A check of all issues including the less important or smaller items is required to ensure completeness. Conversely, what may appear to be overlap may in fact be different aspects of the same concept or stem from different perceptions and interpretations, and through their exploration and consideration, important nuances or insights may emerge. Hence, the application should be rigorous, even if it seems overly detailed; results can not necessarily be predicted and should not be anticipated.

The outcomes of a *Water Centrality* assessment also may depend on the application process itself. In cases where an individual is using the form there are likely to be biases regarding limited understanding of the subject matter or terminology; preconceptions about meanings, uncritical acceptance of processes or content; and generally a subjective view of the issues in question. This bias may be reduced, but never completely eliminated, by getting others to repeat and/or refine the process. However, this may not be problematic unless the process is abused through undue

manipulation or vested interests[41]. Generally, if the *Water Centrality* Principles were applied to the process, e.g. with regard to participation, then some of these concerns may be reduced or become unimportant.

Bias should also be kept in check through the high level of detail provided in the criteria for the 'expectations' in the WCI (although allowance may have to be made for potential biases in the original interpretation). Ideally, once society has agreed to become water central and has reviewed the WCP, the WCI should be subjected to a (participatory) review, based on the revised WCP, so that these biases can either be reduced or are supported by a broad consensus.

Different levels of application may enhance clarity and ease of application. The WCI is a nested instrument with overarching questions for substantive applications, such as higher level policies or national directives, and more detailed questions for procedural, lower level or localised application. Choosing the appropriate level of application may be a key factor in improving clarity, applicability and relevance, which is of particular interest for community engagement and empowerment as the basis of implementation. In all cases a complete assessment may be useful to stimulate thinking about the processes that the policy is instigating and their implications for practical application or implementation. It may also highlight any additional procedural, overarching or general guidance that may be required to help facilitate *Water Centrality* implementation.

A policy should ideally be evaluated in the context of supporting documentation and background information, which may be limited in many cases, particularly in written form. In order to provide a more complete picture and enable a full evaluation, the associated documents referred to in a policy would have to be assessed as well. Some of the WCI questions relate to implementation, which cannot be judged from a policy document alone since it is an expression of intent. Hence, a *Water Centrality* assessment ideally should involve 'the whole package' not only a policy document.

In this context it is advisable to keep in mind that an assessment is a 'snapshot in time' and that it may have to be adjusted or repeated once new supporting or associated

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[41] This may be impossible to avoid completely, but in the normal course of operation within the public service and also business, generally, ethical behaviour and 'good will' can be assumed to prevent abuse of power or personal gain; usually there are also checks and balances in place that prevent excesses. Detailed examination of this would lead beyond the current context and may have to be explored elsewhere.

documents or facts come to light. Alternatively, the purpose of an assessment may be to amend or change a policy, in which case the original document would no longer exist.

However, the WCI application forms only part of a policy assessment and may need to be augmented to counteract some of the disadvantages of a checklist. The instrument as it stands now may be incomplete or biased since it was designed by one person and therefore could be forcing inaccurate results, hence, as indicated earlier, it will require broad review. The process and outcomes are qualitative and subjective in nature which can constrain comparison of different evaluations, also over time, although the AMOEBA may be of use here. Since a checklist provides limited avenues to account for interactions the application process itself may have to make allowances for this, e.g. by instigating discussions that explore such relations.

Lack of implementation following assessment is not an issue that can be dealt with by using the instrument but should be addressed via different avenues external to the assessment process itself (see Chapter 8). Similarly, the restrictiveness, superficiality and lack of guidance of how implementation can occur as well as the lack of assurance that implementation will occur, need to be addressed outside of the instrument application through supportive initiatives, such as supporting documentation or other policies that redress any identified problems.

The instrument has questions that seem to be focussed on water and water management and not related to anything else, e.g. question 4.2 relates to the increasing complexity of water systems. However, if *Water Centrality* is to be the declared aim such considerations would need to be made throughout the socio-ecological system. It may be a matter of referencing a policy or review that has taken place elsewhere, which is not possible at present since such documents or processes do not yet exist, but it should become standard practice as *Water Centrality* is being established.

This highlights the importance of a thorough review of the water system and its interconnections in a clearly identifiable document so that policies that have little direct connection to water, such as the WA youth mental health policy, can refer to it and get a host of questions answered more readily. The case for restructuring the instrument to remove the more water specific questions could be revisited once a water system review has occurred, although caution should be practised since the prompt to attend to these issues may be important in itself to ensure that they are considered and not forgotten.

Some of these difficulties could be reduced by having a team of assessors who cover various complementing areas of expertise, one or some of whom should be familiar with all the associated relevant policies. Identifying an assessment team should be conducted according to the WCP, in a participatory, deliberative manner to ensure that all relevant expertise is available, stakeholders are represented and issues are covered. It may be useful to include the following: an expert in the field in which the assessment is undertaken with a good working knowledge about current policy and practice; a water or *Water Centrality* expert conversant with relevant policies and processes, water system assessments and the state of the water system review (such person should also be a feedback link to the review of the water system in case there are some new insights that should be added to the review); an independent participant or facilitator who is not an expert in either of these fields but has a good understanding of how such an assessment process should work, who can act in an independent capacity and point out cases in which assumptions are implied but not made explicit. However, the review process may not be restricted to a panel but could be a public deliberative process, depending on the issue and level of interest.

The size of groups is an issue which may require special attention since including many different interests may be desirable but can complicate and protract negotiations with a possibility of a deadlock, while insufficient stakeholder involvement may not only prevent agreement but also implementation due to insufficient support for the outcomes (Medema & Jeffrey, 2007). It is conceivable that separate teams could be formed to undertake the assessment with the results compiled at the end (e.g. in situations that affect all residents of a state or nation). Overall, a single team may be preferable since it allows for face-to-face negotiation, although appropriate feedback loops and reviews of iterative or parallel assessment processes may work also if organised and coordinated well. Decisions concerning the form of assessment should be based on individual circumstances in each case.

Conducting the AMOEBA was easier than anticipated, which may have been due to the general low levels of *Water Centrality* compliance found throughout the documents. It was more difficult to assign a level of compliance to those principles that had more sub-points (particularly principle 4) but also to those where compliance varied considerably between sub-points within the principle. It could be instructive to see how different the AMOEBAs would look if other people were to conduct them.

7.2.2 Findings of the WCI Application case studies

Overall, each of the examined policies would need to be rewritten (or replaced) to achieve *Water Centrality* compliance. It was significant that the main shortcomings of both the NWI agreement and the EWP were found with regard to the water elements of the WCP, such as a lack of consideration of the whole water system and its interactions with other elements, missing acknowledgement of water as the 'stuff of life' and limited consideration of social aspects of water. This made obvious that the central consideration of water is not enshrined in current water management practices and policies.

Other elements, such as limited stakeholder and community involvement, lack of capacity building and collective learning as well as issues associated with processes and communication, decision-making and economics (see 6.2.1 and 6.2.2), need to be addressed to make the policies water central. Of particular interest is that the level of compliance regarding the social elements was higher for the mental health policy than for the water policies, while ecological elements as well as water were not considered at all for mental health.

While in this examination the overall level of *Water Centrality* compliance was not satisfactory for any of the case studies, it was notable that the mental health policy was overall more *Water Centrality* compliant than the water policies (compare Figures 7.1, 7.2 and 7.3). This was the case because it was comparatively more participatory, integrative and responsive and espoused higher levels of fairness, community capacity and transparency, despite having little concern for water. Such results are also conceivable for other social policies.

The identified shortcomings of the NWI can be related back to the fact that this policy is founded mainly in liberal market capitalism and structuralist state democracy, which explains its focus on markets which in turn are based on competition and self-interest as well as the state-centred 'top-down' approach to policy and law making (Adams & Hess, 2001; Barber, 1984). Much the same can be said for the EWP policy, though the dominance of the market and economic concerns is not quite as obvious as in the NWI. However, this may be due more to the EWP policy having a narrower focus and being pitched at a lower level, rather than differences in political ideology between the state and federal governments. On examination, the WA youth mental health policy

is less dominated by economic concerns, although the importance of rational economic decisions is specifically mentioned and funding is a recognised concern.

Since the NWI is the highest level water policy in Australia and the EWP policy the most relevant policy regarding the social aspects of water in Western Australia[42] these policies should be reasonably indicative of the degree of *Water Centrality* in Australia. Though the WA youth mental health policy may not be directly relevant to water management in Australia, it shows the limited awareness of the interconnectivity of humans with their natural environment, particularly water. Overall, the examined policies clearly show that both the Federal and the WA State Governments are far from being water central in their approach to water planning and management and any other aspect under their influence, such as youth mental health.

This is not surprising since *Water Centrality* is a new proposal and both governments are examples of representative democracies in which elected decision makers act on behalf of their constituents with limited direct involvement of the people. Hence, it may not be only a matter of adjusting or replacing the existing policies but *Water Centrality* may actually require a substantial (or fundamental) restructure of the social, political and economic system in Australia. These considerations will be part of the final chapter.

7.2.3 Concluding Thoughts

The application of the WCI has revealed some shortcomings and limitations of the WCI, as well as some indication of what the examined policies are lacking, both in terms of *Water Centrality* compliance and with regard to their subject matter. It is clear that all three would need to be rewritten or replaced in order to become water central. However, concerns have also emerged with regard to the existing political and economic systems, which would have to be addressed if *Water Centrality* were to be the declared goal.

Relating the WCI to policy in general has given an indication of where the WCI is placed and what it may be able to achieve (Chapter 6). The current application has returned useful descriptive and prescriptive policy evaluation while the focus on a single document with limited background information has by necessity reduced its interpretive

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[42] The State Water Plan (Government of Western Australia, 2007) refers to social values and uses of water in various contexts where they should be or are being considered and also mentions 'environmental and social water requirement' but does not mention the EWP policy specifically.

power. Nevertheless, the current results allow the conclusion that the WCI not only allows for judging the extent of *Water Centrality* compliance of a policy but can also return information about more fundamental overall shortcomings of a political, social and/or economic system.

The question now is how the necessary adjustments could be made, not only to the policies but to the existing political and economic system as well as the associated governance structure and processes, and who would need to be involved to achieve these changes.

Chapter 8
Toward Ultimate *Water Centrality*

8.1 Introduction

The current status of water management in Australia, and other places, is less than optimal and has contributed to the so-called 'water crisis'. The need for remediation of this situation is paramount in order to promote the long-term wellbeing of the life-support systems of the planet as well as all Australians.

The growing realisation of the importance of the situation is exemplified in Western Australia by the recent creation of a water portfolio and the Department of Water, and the even more recent installation of the Office of Water Resources in the Federal Department of the Prime Minister and Cabinet, which has since been elevated to the Department of The Environment and Water Resources. There is substantial public and media interest in water currently, only eclipsed by the attention to global warming, which in turn has a strong connection to and influence on water.

In Chapter 5, the idea of *Water Centrality* was proposed. This proposal suggests that putting water at the centre of society could improve the current state of affairs regarding environmental, social and resource management conditions. It is argued that *Water Centrality* could improve current sustainability and integration efforts by providing focus through water itself. Building on sustainability and good governance principles, a set of *Water Centrality* Principles have been proposed and translated into an instrument for practical application.

Case studies show how far society is currently removed from making water a central concern, whether in water management or in mental health. If a society were serious about changing its attitude and approach to water then a concept such as *Water Centrality* would be useful, therefore the time is right to explore how *Water Centrality* could be put into practice.

There are essentially three prerequisites to implementing *Water Centrality*: the acceptance of *Water Centrality* as a societal goal; the commitment to implementation; and the practical tools, processes, structures and instruments to achieve this.

There are many facets to these areas that need to be considered if *Water Centrality* is to become a reality. Some facets are touched upon below while the exploration of many others may require broader input and wider ranging expertise. In particular, the following questions are considered:

- What would be necessary and sufficient for *Water Centrality* to be accepted as a societal goal?
- How could the aspiration be translated into action?

8.2 Prerequisites for the Acceptance of *Water Centrality*

Putting *Water Centrality* into practice requires many things, one of which is the insight that this is necessary and another is the political will to make the appropriate changes. Since these adjustments are wide-ranging and affect the whole of society at all levels, broad support is needed. As with sustainability and integration, a major challenge may be a change in the existing worldview if *Water Centrality* is to succeed. Such change goes hand in hand with adjustments of values, attitude and behaviour which result in action 'on the ground' (e.g. Schultz & Zelezny, 1999). The difficulty is that a worldview is not easily changed and cannot be prescribed. While it can be supported, e.g. through education, a willingness to implement such support measures is required, which, in turn, may depend on a change in worldview. This circularity needs to be resolved.

8.2.1 Changing Worldviews

Fundamentally, in order to change a worldview, or beliefs on which a worldview is built, the existing one must become untenable; that is, a realisation must occur that the current situation is no longer satisfactory, and that expected or required outcomes are not being achieved or are not achievable. This can only have an effect on society if a sufficient number of people subscribe to that view; it needs broad support (Saleth & Dinar, 2005). One way of building such support may be to provide compelling arguments that are easily understood and multi-level so that different types of 'engagers' are catered for (Petty & Wegener, 1998). This is important because not only the general public has to be interested but the idea also needs 'champions', such as politicians and business leaders, to ensure that further change is supported and implemented (Saleth & Dinar, 2005).

Water is currently receiving much attention in the media and the literature; the UN has made water a priority and substantial academic research is calling for higher importance to be placed on water. People seem to be talking about water increasingly in everyday conversations and it appears to have become an item of interest also in the business world. There are indications that the time is right for a change; it may be a matter of providing focus and leadership in order for 'social flow' to occur that can take on a life of its own and promote such change (Westley et al., 2006).

Indications are that a crisis point has been reached with regard to water availability in many places (Balonishnikova et al., 2006). Increasing incidence of drought, water shortages, overexploitation of water sources and pollution problems have increased to such an extent that the expression 'water crisis' has become commonplace, which may be an indication of the realisation that the current approach to WM is not working adequately and that a shift may be occurring. This is reflected in the mounting number of voices that are calling for a fundamental 'paradigm shift' to occur (e.g. Falkenmark & the Symposium Scientific Programme Committee, 2005; McAlpine, 2006; UNESCO-WWAP, 2006).

Environmental crisis has been identified as a driver for change (Pritchard & Sanderson, 2002). For example, in the US water shortages have made people more amenable to a change in their attitude towards water (Trumbo, Makee, O'Keefe & Park, 1998). The ongoing drought conditions, as experienced in Australia in recent years, have been identified as a catalyst for change (Saleth & Dinar, 2005), evident in the water management reform efforts around the world. These external conditions have led to a consensus between communities and policy makers (perceptive convergence) creating the conditions for institutional change to occur, which then is shaped by political negotiation and debate, resulting in political convergence (Saleth & Dinar, 2005).

'Crisis' conditions, particularly if associated with economic factors, have been found to be especially conducive to implement reform, even radical transformations, with little opposition (Saleth & Dinar, 2005). "Similarly, when the water sector reform forms part of larger political or economic reforms, its implementation becomes easier owing to synergic effects and scale economy benefits from the larger program" (Saleth & Dinar, 2005 p.8). Hence, the water supply problems in Australia and the current 'mood' for reform may be conducive to promote a larger reform package, such as *Water*

Centrality, particularly since arguments for such reform include financial and economic considerations. In addition, *Water Centrality* provides a tool, the Water Centrality Instrument, for the identification of appropriate institutional design (see Chapter 6).

When sufficient support has been obtained, further backing may be fostered through education (see Section 8.3.2), which has a fundamental role in the process of worldview change. This requires educational institutions or initiatives to 'spread the message', and since these rely on resources from sponsors or governments, these sources need to understand and support the curriculum and the worldview that is being taught or offered (Orr, 2004).

Basically, it rests on these premises: there must be a realisation that the current situation is untenable and there must be an alternative that is sufficiently convincing to obtain broad support so that people and governments are compelled to act accordingly. There may also be some sychronicity involved, as in the case of 'the right idea at the right time' and engaging the right people for 'social flow' to occur. There are indications that this may be such a time.

> For a long time, discourse on radical change in water management has taken place in shadow networks. However, the political recognition and increased awareness of climate change and unprecedented experiences with failures of water management have opened up windows of opportunity in which the willingness to experiment with new approaches is much higher than it used to be. (Pahl-Wostl, Sendzimir et al., 2007 p.16)

Water Centrality is one of those 'new approaches'. It remains to be seen if it will become a 'serious player' in achieving a change in worldview, and whether these changes in worldview will assist, or result in, a paradigm shift, as has been advocated by a variety of authors. However, there are misconceptions regarding paradigm shifts which may be useful to examine further.

8.2.1.1 Paradigm Shift

According to Thomas Kuhn, a paradigm shift in the sciences occurs when the original worldview becomes untenable and a crisis ensues in which new ideas are tried out and a new paradigm[43] forms. This usually happens in a prolonged process and not without conflict, but eventually the new paradigm prevails (while adherents to the old paradigm die out) (Kuhn, 1962). Although Kuhn has limited the term 'paradigm shift'

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[43] A paradigm consists of a worldview plus the tools, processes, methodologies and associated theories.

to the sciences, it is used more widely now, albeit not always in the sense it was originally intended.

Quotations, such as the following, are indicative of how the concept of 'paradigm shift' is misunderstood:

> There is widespread interest in a paradigm shift to a new model that questions the traditional methods of governing water resources, as well as an ongoing debate as to what this new paradigm entails. This involves the search for new judicial norms, flexible institutions, demand-driven water policies, new concepts of water types (blue and green water, see Chapter 4, or virtual water, see Chapter 12), as well as sustainability, transparency and public participation. Conflict prevention and similar concepts of interdependence in other efforts to share water resources in a sustainable manner are also pivotal. (UNESCO-WWAP, 2006 p.381)

A similar paradigm change advocated by the SIWI, IFPRI, IUCN and IWMI (2005) concerns the recognition of the key role of water in food production and security. Fundamental policy changes are proposed with regard to governance, capacity building and awareness raising as well as financing and others to facilitate secure food supplies and, by default, appropriate water systems management. The demand for "ingenious management and sound stewardship of the entire water resource" (SIWI et al., 2005 p.7) includes the consideration of blue water (water bodies and aquifers) as well as green water (soil moisture, vapour and rain).

While there are valid reasons to promote change, in water management as well as more broadly in society, a paradigm shift cannot be planned. All that can be said is that these suggestions, the *Water Centrality* proposal included, may be part of a paradigm shift already in progress. While such a process has been acknowledged as occurring (Pahl-Wostl, Craps, Dewulf et al., 2007), what the eventual new paradigm will look like nobody can tell; the details will emerge if, and when, it happens. According to Kuhn's theory, conflict will occur between adherents of the old and the new ideas; so if a shift should occur it is not expected to be an easy transition. Whether a paradigm shift has actually occurred can only be judged in hindsight.

8.2.2 Compelling Arguments for Water Centrality

The main arguments for *Water Centrality* concern three main facets. Firstly, the importance of water, its interconnectedness with nature and humanity's utter dependence on it and nature; secondly, the intuitive appeal and the existing knowledge

of water in the population; and, thirdly, the potential improvements that a focus on water can bring for sustainability and integration.

Above all, the fact that water is effectively essential for everything on the planet, especially for biological life forms including humans, should assist in putting things into perspective (Section 5.2). While there is increasing recognition of this globally, the full extent of it, particularly regarding the more hidden or indirect aspects, will need emphasising and highlighting.

People and nature are intimately connected (Kellert, 2005; Wilson, 1993), with a fundamental element in this connection being water (Falkenmark & Folke, 2002). Although this is becoming more widely acknowledged, particularly with the recognition of a growing water 'crisis' around the world, the still limited level of acknowledgement of this fact is redressed in *Water Centrality*, which affirms water as the basis of society. *Water Centrality* has the potential to reinforce the message of society's utter dependence on nature and water. It helps show the way in the required change of values, attitudes and worldview throughout society, and the resultant changes to institutions, structures and processes.

In this process, caution is required as to how water is portrayed. There is potential for manipulation or perpetuation of misconceptions, if water is only shown in certain forms and contexts. An example of this is the clean, blue, sanitised version used for interpretational purposes at the Hoover Dam in the USA to contrast the 'dirty' river water that needs to be 'tamed' for human purposes (Rogers & Schutten, 2004). Effective education should be designed to convey a holistic view of water to counteract or prevent such misconceptions (section 8.3.2).

Water could be a suitable catalyst to interest people in participating in *Water Centrality* initiatives, because of its importance and growing scarcity, and its intuitive appeal, as well as the existing level of general water knowledge in the population (Strang, 2005). As Marrin emphasises (2002) water is connected to the emotions and has special meaning for many people.

Holistic water management should involve the whole person, including physical and social needs, as well as mind, emotions and spirituality, because water has a connection with all of these. Earlier cultures, such as that of the Ancient Greeks, not only knew about the importance of water but also revered it as a life force and mediator

(Marrin, 2007). To this day, many people relate to water at a deeper level, therefore appealing to this knowledge and bringing it to awareness could help 're-place' 'whole' people (physically, emotionally and spiritually) in a whole environment.

In addition, *Water Centrality* is based on sustainability and integration, both well-accepted concepts that are becoming more widespread, which could make it easier to convince people, including politicians and other decision makers, of the value of *Water Centrality*, and to gather the necessary support, politically and otherwise, to make the relevant changes throughout society.

Water Centrality is not only following on from, and incorporating, the original ideas of sustainability and integration, but aims to unify them by giving them a clear focus in the form of water, arguably the most integrative substance or force on this planet. Although the importance of water for sustainability has been acknowledged (e.g. Africa Water Task Force & IWMI, 2003), this has not been formalised or operationalised. Similarly, the function of water in the provision of ecosystem services has not been fully appreciated (Falkenmark & Folke, 2002), which means its role for ecological, economic and social functions in sustainability is underplayed. Currently, despite efforts of integration, water is mainly considered in a compartmentalised fashion as a part of separate ecological, economic or social considerations; water is seen as only one element of many that needs to be managed sustainably, thereby scattering efforts and resources (Falkenmark & Folke, 2002).

By incorporating the central ideas of sustainability, as expressed in the *Bellagio Principle* (1997), then focussing them on water and its values, sustainability is turned into *Water Centrality*. Potentially, this could significantly reduce some of the vagueness currently associated with the concept of sustainability, narrowing the definition by providing a focal element and limiting the possibilities for interpretation and misinterpretation. *Water Centrality* has a simple message: without water there is no life and both are essential for society. Therefore society's priority should be the water system and its proper function; everything else follows from that.

This includes the aspects recognised in the MEA as in need of attention, such as: institutional and governance arrangements; the market system and economic incentives; redistribution of political and economic power to disadvantaged groups; increased investment in development and distribution of technology to increase efficiency of ecosystem service use while reducing harmful impacts. In addition, improvement of and

better use of knowledge about ecosystem services as well as management, policy, technology, behaviour and institutional changes to increase service benefits while reducing impacts are highlighted (Millennium Ecosystem Assessment, 2005). It would be unrealistic to assume that all these issues could be solved by *Water Centrality*, but since it addresses most of these issues or provides for their consideration, its implementation would be a catalyst for many of the required changes.

Giving water the central role in society would link all elements of concern in integrated management, while providing an easily accessible, natural focus for all parties involved. The GWP has recognised the interconnectivity and influence of water with and on other sectors, such as agriculture and energy, and has realised that changes to policy in other sectors may be more effective in achieving desired outcomes (GWP, n.d.-a). Currently, there seems to be a discernible lack of awareness of this in the other sectors, since "water is frequently neglected when decisions are made about crop patterns, trade and energy policies, urban design and planning, all of which are critical determinants of water demand (GWP, n.d.-a p.5)".

It appears to make more sense, and be more integrative, to use the already existing unifying element in all sectors – water – to achieve integration from within, instead of starting from a separate base and attempting to unify relevant elements in the water sector and then reach out to others. Supporting this notion is the realisation that water is pervasive throughout the economy and that almost all national economic and social policies could have major impacts on water use (GWP, n.d.-a).

The shortcomings of integration can be found in the following areas (details in Chapter 4):

- legal and institutional frameworks;
- complexity/fragmentation;
- collaboration and cooperation/community participation;
- scale;
- social aspects;
- knowledge, understanding and education/science;
- capacity and capacity-building;
- government commitment, political will and vested interest; and
- infrastructure and technology focus.

Water Centrality addresses all the issues in this list other than the last two, which cannot be resolved through an approach or a set of principles but need a change in attitude and value system or worldview. However, *Water Centrality* has the potential to instigate government commitment and political will because of its focus on water, which is already high on the agenda. Vested interest would perhaps be most difficult to address, but an attempt could be made for a clear connection of the importance of water (and *Water Centrality*) to the actualisation of self-interest. It may take time to modify the focus on infrastructure and technology although application of *Water Centrality* should help promote changes that are already occurring. An important element in this change may be the greater involvement of women throughout, as they generally have a different perspective and experience from the dominant view (Schultz et al., 2001).

In contrast to integration alone, *Water Centrality* considers all values of water and acknowledges the utter interconnectivity of all 'pillars' thereby transcending this view. *Water Centrality* recognises the dependence of the economy on water, highlighting the impacts of continued, unfettered economic growth and the inappropriateness of water markets based on monetary value alone. Water would be the common denominator and basis for the economy.

Water Centrality helps to address past shortcomings by incorporating the social aspects of water, thus reducing fragmentation and the need for separate assessments. Psychosocial aspects of water management are an integral part of *Water Centrality* and, while they still may need to be identified, this should be an integral part of the *Water Centrality* assessment or process, which aims at incorporating the psychosocial, ecological and economic aspects of water in combination from the outset. While questionnaires and public meetings or forums have had and may continue to play an important role, *Water Centrality* acknowledges that to do justice to psychosocial issues they cannot be identified and accounted for through such techniques alone; they are so intertwined with other areas of human endeavour that it takes more than 'tacking on' social issues as an afterthought, or identifying them separately and then somehow 'including' them in decisions.

Water Centrality could be regarded as a 'social' approach to WM or NRM, since it regards economic concerns as essentially social issues and recognises the crucial role of values and the involvement of the whole of society. Economic concerns (e.g. 'bulk water allocations') are essentially treated as a social element in *Water Centrality* since

they are part of the decisions about how society uses water and for what purposes. This should include monetary as well as non-monetary values.

Similarly, currently-named environmental allocations could be seen as social elements since a well-functioning natural environment is a prerequisite for a well-functioning society. Arguably, all the elements – environmental, social and economic – cannot be treated or identified separately due to their highly interconnected nature, but importantly, it needs to be recognised that a separation of these aspects underpins the separation of humans from each other and the natural world, leading to fragmentation rather than wholeness. That is why *Water Centrality* recognises the total dependence of society on the environment and water, which makes it an 'eco-social' or 'hydro-eco-social' approach.

Water Centrality is not only about what humans need water for but how we can acknowledge, respect and treat water more appropriately. Appropriate techniques and methods to consider and take account of all the values of water may not exist as yet, but the Water Centrality Principles and the Instrument would prove useful guides for finding and devising ways and methods to account for water values in a holistic manner.

Arguably, water is as central to Australian society as other 'Australian values'. These include "democratic values, a commitment to 'a fair go', equality and respect for each other"[44] (Australian Government, 2007). Combining water with all these values, as done in *Water Centrality*, should be welcome as an opportunity to improve the common good and wellbeing of the nation.

Water Centrality should also inspire cooperation, since it can be argued that supporting water in any way will profit the whole of society as well as the individual. The argument for *Water Centrality* for those subscribing to a neo-liberal and market-economic viewpoint would be that looking after water equates to wealth maximisation, while undue competition can be counterproductive to keeping water cycles in good working order. Since *Water Centrality* is inclusive, it should be able to facilitate the required changes based on social choice.

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[44] The DIC publication *Becoming an Australian Citizen* lists Australian values including: respect for equal worth; dignity and freedom of the individual; freedom of speech; freedom of religion and secular government; freedom of association; support for parliamentary democracy and the rule of law; equality under the law; equality of men and women; equality of opportunity; peacefulness; tolerance, mutual respect and compassion for those in need. (Australian Government, 2007b)

Compared to other environmental ethics (Baird Callicott, 2000), *Water Centrality* can be seen as incorporating ideas of such ideologies as ecofeminism or social ecology, particularly in terms of equality and justice. While falling somewhat short of the full ethos of 'deep ecology', insofar as *Water Centrality* may not require the feeling of being 'at one with the web of life', it clearly has pragmatist elements in assuming a holistic stance. This is particularly apparent in the locally based, democratic style of solution-finding and decision-making that attempts to amalgamate both 'top-down' theoretical perspectives with 'bottom-up' practical ones, accepting that 'one size does not fit all' (Baird Callicott, 2000).

It is highly likely, expected and even desirable that the existing *Water Centrality* proposal will be adjusted and changed to suit the society and circumstances in question. As stressed previously, the WCP are open for interpretation since flexibility is important in addressing situations that require different approaches and solutions, provided they fit the overall mandate to make water the centre of concern and decision-making and that everyone has the opportunity to be involved in highly participatory processes and activities. This should correct the breach of principles inherent in the construction of the current WCP, that is, the very limited community input.

Although *Water Centrality* may be a bold vision it is also, arguably, well supported, makes sense and is well placed, through the unifying element of water, to provide a natural focus for society's efforts to achieve a 'good' life within the natural capacity of the planet. Water encompasses both living and non-living factors important for the planet, which should be attractive to people from many different backgrounds and convictions. But while there are some compelling arguments for *Water Centrality,* there are potential barriers and challenges that will need to be overcome.

8.2.3 Challenges for Water Centrality

Any new idea, particularly one as broad and encompassing as *Water Centrality* that requires fundamental changes to the whole of society, is bound to be controversial and have opposition. How large that opposition is and whether it will be possible to overcome it is an issue for the future, though a number of the challenges and issues can be anticipated and discussed now.

The associated societal changes may be particularly difficult to accept by that part of the population which subscribes to a neo-liberal worldview and/or whose main

interest in water is financial or based on a resource view. It is envisaged that there will be opposition to the necessary associated changes to the political and economic system. Much of this resistance will be derived from a desire to protect existing interests, especially with regard to power and money. In addition, it may be difficult for people to see the link of *Water Centrality* with social policy or seemingly water-unrelated issues or to make the connections with and between the different scales (local, regional, national and global); however, these relationships should become clearer with broader and more extended application of the WCP and the WCI.

It is important to be aware that, while the WCP and the WCI can act as useful guides and tools, they also have their limits; other tools and processes will need to be found to fill the gaps. The potential for misinterpretation and abuse may be another difficulty that could be counteracted by ensuring a strong vision and ongoing vigilance. If *Water Centrality* were accepted as a societal aspiration then it would be logical to expect the general thinking to adjust and correct for any misinterpretation over time.

It is also expected that resistance will come from existing structures and institutions (Molle, 2006b), some of which would have to change considerably to adjust to the requirements of *Water Centrality*. Other anticipated arguments would be that the required new processes are too unwieldy and unsuitable to manage water and other affairs, and that changes are too costly.

> Because reforms change the status quo, one can expect both support for and opposition to reform agendas by various affected groups. Water institutional reforms generate active involvement by various interest groups that may be affected directly or indirectly. (Dinar, 2001)

The as yet limited store of knowledge of the very complex water system could also be seen as precluding the success of *Water Centrality*. However, this knowledge is ongoing and ever-expanding (see also section 8.3.2) and given that thinking of water first is established, any lack of knowledge in particular areas may not preclude appropriate action.

There will be difficulties in discerning water uses and values as well as their interconnections, and processes may be unwieldy, but research and development of new approaches and tools, which is occurring already, should begin to address the issues. *Water Centrality* would require specialised practitioners trained to deal with complex and adaptive situations in addition to sufficient and ongoing financial resources.

Humans have traits that may be disadvantageous in the management of complex common good systems. These include: selfishness; greed and power hunger; inertia; laziness and lack of confidence as well as meanness or criminality. Lack of interest, fear of change and lack of information are other barriers. An important point is that people may perceive their contribution making no difference or that they may lack the capability to participate (Lindenberg & Steg, 2007). The reason it is useful to acknowledge these traits and issues is that ways need to be found to deal with them. *Water Centrality* could provide a vehicle for empowering, educating and enthusing people to focus on a common cause that is the root of survival and wellbeing.

Although many of these limitations and challenges are formidable they can all be overcome, given time, support and resources. While this may be also true for other worthwhile approaches and ideas, e.g. IWM or sustainability, *Water Centrality* has an advantage in being concerned with a universal substance of recognised importance and broad appeal that is tied to a whole-of-society context, thereby increasing the likelihood of securing these essentials for the common good.

While *Water Centrality* will not have all the answers to the woes of society it may be an approach that can achieve a more effective integration of economic, ecological and social aspects through the guidance provided in the WCP and the WCI. Ultimately, the application of these tools will show if this is the case; however, the existing rhetoric of integrating the three areas, which stems from sustainability, is expanded in *Water Centrality*. Hence it is reasonable to assume a progression of acceptance and understanding in the wider community. The existing familiarity with sustainability should help in advancing the concept of *Water Centrality*, especially if it can be shown that making water the central concern of society can provide greater security and wellbeing. Overall, the connection with water should provide more intuitive as well as intellectual appeal (e.g. Strang, 2005).

8.3 Translating Aspirations into Action

While a change in worldview is probably the most difficult hurdle to overcome on the road to *Water Centrality*, there are other aspects to consider on the way to implementation. Besides having the right tools and processes at hand, it also takes the appropriate attitudes and beliefs for behaviour to follow suit (e.g. Ajzen, 2006).

There are many initiatives, processes and tools available that could be utilised in putting *Water Centrality* into practice. It seems prudent and wise to examine them for usefulness and *Water Centrality* compliance then adjust those that are promising as needed. It could also be advantageous to ensure that previous work and input from stakeholders in, for example, a water plan or strategic document are acknowledged and utilised as far as possible thereby reducing disappointment and ensuring ongoing support (Bowmer, 2004a). While caution will have to be exercised due to the possibility of continuing with 'business as usual', existing *Water Centrality* compliance may be discovered in more or less unexpected areas.

Setting priorities may be sensible for the implementation of *Water Centrality* since time and capacity are limited. Some caution should be exercised because of limited knowledge and understanding, but at the same time there is great urgency for society to act since the whole water system is being impacted increasingly every day.

Knowing what to do, when to do it and how to do it needs to be followed by doing it; this is the case for all levels of society. There are settings or situations that are more compelling than others to follow through with action, e.g. a work place with set rules and 'quality control' may be more conducive compared to a home environment in which there may be little compulsion to perform a certain activity or show a certain behaviour. However, there is knowledge available about what can be done to help people wanting to behave in certain ways that could be used by the government and other organisations that are charged with the task of translating ideas into action.

8.3.1 Changing Behaviour

Years of research on behaviour and behaviour change in an environmental and sustainability context has produced tomes of publications (Vlek & Steg, 2007). There are many theories of what influences human behaviour and how changes in behaviour can be achieved (e.g. see overview in Lindenberg & Steg, 2007). Reviewing these is not the purpose of this thesis; suffice it to say that generally these theories explain how people behave in certain circumstances but that no single theory can explain behaviour in all situations, which makes it more difficult to effect changes in behaviour. Having better understanding of behaviour will be needed for the implementation of *Water Centrality*.

A new approach to behaviour and behaviour change has been proposed by Lindenberg and Steg (2007), who suggest that environmental behaviour is influenced by 'multiple motives'. This is explained through 'goal-framing theory' which postulates that "goals 'frame' the way people process information and act upon it" (p.117). Three different goal frames, hedonic, gain and normative goal frames[45], are always active but one normally dominates at a given time depending on conditions. Normative goal frames imply pro-environmental action while gain and hedonic goal frames often result in the opposite, hence "pro-environmental behaviour may be promoted by strengthening normative goals or by making gain and hedonic goals less incompatible with normative goals" (Lindenberg & Steg, 2007 p.117).

Since, in a normative goal frame people aiming "to act appropriately" is an abstract norm (as opposed to an internalised one[46]) a second step is required to discern what behaviour would befit a certain situation. Such norms have also been called 'smart norms' since they require an intellectual effort, which becomes more demanding the more abstract the norms are (Lindenberg & Steg, 2007).

> In order to deal with smart norms, individuals need information, for example, on what is environmentally harmful, rather than moral training for internalization. This is likely to have changed the relation of scientific knowledge to normative behaviour from what it was in traditional societies where these two were quite separate. When people want to act appropriately but do not know how, it is likely that either the gain goal or the hedonic goal displaces the normative goal frame. They give up and go with the more selfish motives. (Lindenberg & Steg, 2007 p.120/121)

This means, that public policy would need to provide sufficient and appropriate information, 'moralise' the appropriate behaviour (by instilling strong negative feelings against inappropriate behaviour) and reducing competition from opposing hedonic and gain goals. It would also include "identifying the factors that promote and inhibit pro-environmental behaviour, of developing interventions aimed at overcoming these barriers and at evaluating the actual effects of such interventions (see Geller, 2002; McKenzie-Mohr, 2000; Steg & Vlek, in press), be they internal to an individual (e.g.

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[45] A hedonic goal is based on emotions and people want "to feel better right now", people with a gain goal want "to guard and improve one's resources" while a normative goal motivates "to act appropriately" (Lindenberg and Steg 2007 p.119). The hedonic goal frame is the most dominant since it relates to need satisfaction, while the gain frame depends on institutions (religion, secure property rights) for support, which is even more so in the normative frame, requiring institutions, moralising or explicit disapproval.

lack of knowledge for following smart norms) or outside the individual (e.g. lack of feasible alternatives)" (Lindenberg & Steg, 2007 p.132). The *Water Centrality* Principles could be translated into normative goals and used to help design suitable interventions to assist people with acting appropriately in a water central society.

According to Osbaldison and Sheldon (2002) resistance to common social goals (such as *Water Centrality*) comes above all from people with a competitive social value orientation (SVO), who make up approximately 20% of the population. Such people are only interested in gaining an advantage over others although the outcomes may be detrimental to all, including themselves. As if this were not problematic enough, such a stance also has the tendency to be passed on to others, mainly those who have an individualistic SVO (ca. 60% of the population), who generally see the advantage of working together for the common good, but do not like being taken advantage of and so join the competitors (Osbaldison & Sheldon, 2002). Cooperators, the remaining 20% of the population, are those with a pro-social SVO and best suited to goals that maximise gains for all. Cooperation is clearly the value orientation that is desirable for *Water Centrality*. Hence, it would be important to find out if water could be a suitable medium to influence values orientation. It is conceivable that water could reduce a competitive SVO, or strengthen resistance in those with an individualistic SVO, based on its intuitive appeal and importance.

Behaviour change can be achieved through a variety of approaches. They include rules, sanctions and incentives, as well as provision of information, technical alternatives, social examples and organisational change (e.g. Gardner & Stern, 2002; Lindenberg & Steg, 2007; Osbaldison & Sheldon, 2002; Vlek & Steg, 2007).

Sanction or mutual coercion approaches (e.g. legislation and regulation) work best for relatively simple systems, but may be problematic for more complex situations with a constantly changing knowledge base that is difficult to deal with in laws and regulations as a set of clear standards and sanctions. Sanctions also seem to work better the more a limited resource is under threat, by which time it may be too late for the approach to work (Osbaldison & Sheldon, 2002). There may also be a 'counter-productive reactance' against laws that affect life-style choices (as was the case e.g. in the Prohibition in the USA) where people may try to reassert their autonomy

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[46] Lindenberg and Steg (2007) point out the differences of goal frame theory to other sociological theories of behaviour in which normally social norms are internalised, guiding people's behaviour without them having to think about it much.

(Osbaldison & Sheldon, 2002). Punitive sanctions may "undermine people's intrinsic motivation and their ability to enjoy what they are doing" (p.45) leading to dislike and aversion. Those sanctions also overlook the potential of individual growth, creativity and challenge, which may be the most important elements in maintaining desirable behaviour and spreading it to other domains and people (Osbaldison & Sheldon, 2002). *Water Centrality* would provide ample opportunity for people to grow, be challenged and use their creativity in finding solutions.

Approaches that aim at changing knowledge, beliefs and preferences are also termed 'demand-side-management'. Information can help people to change their behaviour since they then can make intelligent decisions. However, this has limited success because people are biased toward "information that is local, dramatic and simple" (p.46), while in complex and far-reaching situations (such as sustainability and *Water Centrality*) much of the available information is controversial and uncertain (Osbaldison & Sheldon, 2002). Related methods, such as marketing and advertising also have been found to have limited effects (Vlek & Steg, 2007).

It is important to provide accurate information, as "only when the new beliefs accurately reflect reality can we expect that the effect of the intervention will persist over time" (Ajzen, 2006 p.5). A good rationale reduces negative feelings and supports the creation of more stable attitudes and norms (Lindenberg & Steg, 2007). It may also be more productive to introduce information that aims at forming new beliefs instead of changing existing beliefs (Ajzen, 2006). Combining interventions, such as information and incentives, may be most successful (Stern, 1999). Methods used in 'supply-side-management', which influence the choices available may also be useful and include changes in provisioning systems, supply of infrastructure and technology, and pricing (Vlek & Steg, 2007). It is proposed that *Water Centrality* provides or has the potential to provide all of these requirements.

Even with a combination of incentives, behaviour may not change. A reason for this may be a weak link from intention to behaviour, and those designing interventions need to ensure that such links are strengthened (Ajzen, 2006). An effective way to strengthen weak intention-behaviour links and to assist people in carrying out their intentions is the use of an 'implementation intention', which entails planning in detail "when, where, and how the desired behaviour will be performed (cf. Gollwitzer, 1999)" (Ajzen, 2006 p.5/6). Such voluntary pledges strengthen commitment by activating

personal norms (Lindenberg & Steg, 2007). Water and *Water Centrality* should be well suited to strengthen people's resolve and assist in appropriate action.

The issue of habitual behaviour also needs to be addressed. One way is through 'unfreezing' the habit by raising the level of consciousness (Jackson, 2006). Another is to use persuasion to change habits (Seethaler & Rose, 2005) and behaviour (Cialdini, Demaine, Sagarin et al., 2006). However, care has to be taken in formulating messages so that it is the intended effects that are obtained and not the opposite. For example, information about the level of other people's behaviour (descriptive norm) can lead to an increase in that behaviour, while information about the level of people's disapproval regarding a behaviour (injunctive norm) can suppress it (Cialdini et al., 2006).

Jackson (2006) distinguishes four categories of usual approaches to achieve changes in society to avoid harm and to support wellbeing: laws, regulations and incentives set by government; education programmes with the aim to change attitudes; community or small group management; and moral, ethical or religious appeals. He sees the first, second and fourth options as standard interventions of the predominant worldview that have lead to the current, unsustainable situation in which society finds itself.

The third option for interventions lies outside this standard menu and seems to show the greatest promise in actually achieving sustained outcomes (Jackson, 2006). The "combination of participatory decision-making, monitoring, social norms and community sanctions" (Jackson, 2006 p.117) seems to make this approach successful. Interestingly, compliance is based on "internalisation of the group's interest by individuals in the group" rather than by sanctions (Jackson, 2006 p.117). The deliberative and participatory nature of *Water Centrality* should support the social and behavioural changes that it requires.

In this context, Osbaldison and Sheldon's (2002) techniques based on the Self-Determination Theory (SDT) developed by Deci and Ryan seem valuable. SDT assumes that motivation exists along a range from completely external to a person or being controlled by others or situational elements to completely internalised or autonomous and self-determined. Internalised motivation is associated with many positive effects such as increased enjoyment, creativity, wellbeing and flexibility as well as increased persistence (Osbaldison & Sheldon, 2002).

Indeed, people who internalise the motivation to do a behaviour do not perform the behaviour out of a sense of guilt, responsibility, or dread; rather, they perform it with a sense of value, importance, and enjoyment. (Osbaldison & Sheldon, 2002 p.53)

This approach can be used in any intrapersonal situation where a person, or institution or government, is asking another person, or a group or a society, to change behaviour. It can be done verbally, through the media or by negotiations, and uses an 'autonomy supportive style' in the formulation of messages. This acknowledges the requestee's position, but not overly so, and provides real choice for ways of acting or, in cases where there is no choice, avoids fear and doom, which are counter-productive, and counteracts defensive or reactive responses by broadening the worldview and showing solutions (see Osbaldison & Sheldon, 2002 for details).

The use of 'smart norms', mentioned earlier, similarly require a 'translation' into lower level smart norms that are linked to specific behaviours or activities (Lindenberg & Steg, 2007). It is important for the smart norm to be strong enough to be easily activated, which may include information about how the current behaviour harms others. In addition, compatibility of the hedonic and gain goals must be ensured or they must be weakened (Lindenberg & Steg, 2007).

Tailored information is more successful than general information, for example, environmental labelling may be useful in facilitating pro-environmental behaviour, and feedback on behaviour can be used to strengthen normative goal frames, e.g. to save water, both for personal and social norms. 'Moralising', i.e. associating bad feelings and emotions to an undesirable behaviour or using pledges or promises to act appropriately, can strengthen smart norms (Lindenberg & Steg, 2007).

In short, both sufficient knowledge and awareness are necessary for the appropriate action to take place, in which education and learning play crucial roles.

8.3.2 Education and Learning

While lack of education is a problem, education itself can also be a problem. The content of what is being taught and the way it is being taught has long-term effects on how those being educated interact with their environment; sometimes with devastating effects, as seen in the deteriorating state of the planet and many human societies (Orr, 2004). Hence it is vitally important that education is redesigned to support the values and worldview that support *Water Centrality*. Of the many different approaches to

education some of the newer, more holistic ideas aimed at fostering pro-environmental behaviour appear suitable for *Water Centrality*. Their closer examination also requires the consideration of aspects of learning.

Ecological literacy or ecoliteracy is a systems approach to education which endeavours to foster the understanding of the basic principles of ecology (i.e. networks, nested systems, cycles, flows and developments) so that they can be embodied in daily life (Capra & Crabtree, 2000). It is an experiential, environmental project-based, place-based, participatory way of learning that requires a reform of the existing school system (Capra & Crabtree, 2000). Projects undertaken in such a way, even if initiated within a school, tend to engage with the wider community resulting in a broader system-type change (Centre for Ecoliteracy, 2000). Ecoliteracy can lend itself to adaptation for use in *Water Centrality*, as 'water literacy' (see section 8.3.2.1).

Social learning is a form of whole system learning that is essential for any adaptive approach that combines management and policy with learning, such as *Water Centrality*, in order to "increase the ability of the whole system to learn about and change the context within which it responds to change" (Pahl-Wostl, Sendzimir et al., 2007 p.7/8).

Social learning processes require:

- opportunities for critical mutual reflection and the awareness and modification of assumptions and cultural frameworks that are taken for granted;
- the development of participatory, multi-scale, democratic decision-making processes;
- reflexive capabilities of individuals and societies for the development of polycentric forms of resource assessment and management;
- the empowerment of social movements and actors to shape the political and economic boundary conditions that determine their opportunities to become involved in the processes aimed at improving the existing situation;
- the recognition of mutual interdependencies and interactions in the existing networks of action;
- an increase in the capacity to reflect on assumptions about the dynamics and cause-and-effect relationships in the system to be managed and on the subjective valuation schemes; and
- the active engagement of individuals in collective decision processes. This may include the development of new management strategies and the introduction of new formal and informal rules. (Tàbara & Pahl-Wostl, 2007 p.12)

Sustainability learning, a concept derived from social learning, is also concerned with learning how to live with the life-supporting environment (Tàbara & Pahl-Wostl,

2007). It seems to be similar to ecoliteracy in that it promotes learning in a practical, participatory, empowering, inclusive, interdependent, and system-based way (Pahl-Wostl, Craps et al., 2007; Tàbara & Pahl-Wostl, 2007). However, both sustainability learning and social learning appear to be broader-based since they do not focus on school education but are aimed at both institutions and the wider society – they are a form of general public education.

While all these forms of learning seem to have great potential to improve humanity's relationship with nature, amongst other things the current Western views about how learning occurs may have to change. A way of learning described by Caine and Caine (2000) may be more suitable. Their 'brain-based' way of learning is an amalgamation of recent discoveries in brain research and many other fields, e.g. creative and whole language, sports psychology and perceptual change, memory and construction of meaning, to name a few.

Brain-based learning or 'brain/mind learning' goes beyond mere information processing but regards the learner as a "self-organising whole that constantly interacts on multiple levels with its environment" who plays an active role in the learning process (Caine & Caine, 2000 p.51). Teachers are facilitators and guides of learning in the real world from the start (Caine & Caine, 2000).

The twelve principles of brain/mind learning are (Caine & Caine, 2000 p.52):

- The brain is a living system.
- The brain/mind is social.
- The search for meaning is innate.
- The search for meaning occurs through 'patterning'.
- Emotions are critical to patterning.
- Every brain simultaneously perceives and creates parts and wholes.
- Learning involves both focussed attention and peripheral perception.
- Learning always involves conscious and unconscious processes.
- Memory is organised in at least two ways.
- Learning is developmental.
- Complex learning is enhanced by challenge and inhibited by threat.
- Every brain is uniquely organised.

The implications of these principles are far-reaching and fit well with *Water Centrality*, which is also based on systems, values, involvement, community, ongoing learning, support and diversity. In socio-ecological systems, adaptation can be equated to a form of learning with a multitude of processes interacting at various scales (Folke, Hahn, Olsson & Norberg, 2005). Processes include the formation of networks and

determination of roles of leaders, management of knowledge structures, trust building, social capital, interpretation of information, as well as establishment of ways of collaboration within and between organisations (Folke et al., 2005).

This is also recognised in social learning where so-called 'communities of learning' (and action) tend to form in which collective understanding is created which can lead to adaptive transformation and includes "learning to create resource institutions based on redundancy, policentricity, and diversity" (Tàbara & Pahl-Wostl, 2007 p.3).

Social learning (e.g. Pahl-Wostl, 2006a; Pahl-Wostl, Sendzimir et al., 2007) and its derivative sustainability learning (Tàbara & Pahl-Wostl, 2007) could be adapted for use in *Water Centrality*. Both forms of learning have been used in WM applications before and fulfil many of the requirements of *Water Centrality* as outlined in the WCP; a change in focus towards water could result in 'water learning' or 'water literacy'.

8.3.2.1 Water Literacy

> Water is a mirror for us, if we only take the time to look at the essential qualities held within its nature. Water is the expression of flowing; reflecting; coalescing; transforming; and cleansing. It is the most perfect teacher with which humankind has been gifted. The Tao Te Ching says of water: "that which is of all things most yielding can overcome that which is most hard". It is by yielding that water can speak to our hearts as we too embrace this quality; learning what it is to flow together as one people respectful, mindful, energetically discarding the hard protective shells of indifference for inclusive whole life friendly living. (Cate Burke and Deborah Lange, waterlution, 2003/04/05/06)

There are different ways of learning about and from water. More intuitive or philosophical approaches may be as valuable as those based on the scientific method. Ecoliteracy, based on ecosystems (see section 8.3.2), could be adapted to become 'water literacy', which would have water and the water system at its heart. Water literacy would combine ongoing learning by incorporating 'water knowledge' into everyday life at all levels and in all areas. It would not be limited to schools and other formal institutions but would extend to all of society.

The difference between ecoliteracy and water literacy may be less pronounced than it looks at first glance, resulting in similar outcomes since all ecological processes have water as an essential element. The main distinction could be a perceptual one insofar as water may provide a more tangible and neutral, or less 'green', starting point that could be valuable in eliciting the interest of industry, business, institutions and

other elements of society that traditionally do not have a close affinity with the environment and 'green' thinking. Once these players are involved and start learning about and *from* water, its nature and interconnections, it is conceivable that communities of learning emerge (as envisaged in ecoliteracy) that result in system-wide changes and assist in the 'internalisation' of water – the realisation that we *are* water.

A more general or 'big picture' approach as part of the review of the whole water system, would aid in awareness raising and education at the same time as decision-making. Such an approach should include *Water Centrality* assessments of processes and activities as well as the collection of local and indigenous knowledge. The Water*mark* Australia project is such an initiative of awareness raising and education, with its publication, *Our Water Mark*, (Victorian Women's Trust, 2007) being a valuable informational and educational resource for ongoing change in awareness and behaviour. The WaterWiki, hosted on the Internet (http://europeandcis.undp.org/WaterWiki/index.php/Main_Page) by the UNDP is also a promising initiative (UNDP, 2007).

Ultimately and ideally, all existing water information should be identified and monitored as part of an international database, which could be termed the Global *Water Centrality* Database. To be effective this comprehensive knowledge base would need to be: cooperatively run; based on ongoing monitoring; regularly updated; innovative in dealing with the interconnectedness of water issues and initiatives publicly; collecting different types of knowledge, e.g. scientific, local, indigenous; utilised as a guide for water management; accessible as a learning resource; and, easily accessible and user friendly.

It could be built on initiatives such as the Sustainable Rivers Audit (SRA) for the Murray-Darling Basin in Australia, which was started in 2004 with the purpose of enabling the assessment of river health and its associated ecology over time (MDBC, 2008), and, on an international level, the World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP), launched by UNESCO in 1999 with the aim of collecting data and producing maps of the world's groundwater resources (Bundesanstalt für Geowissenschaften und Rohstoffe, 2006). Some of the greatest challenges will be the inclusion of indirect effects on and in the water system, such as the loss of rain production capacity associated with loss of vegetation, or hydrological

effects associated with afforestation or reforestation (Zomer et al., 2006). Further issues associated with the values of water may need to be identified and quantified.

Other projects that are not directly dealing with water knowledge may also be valuable. This includes the International Human Dimensions Programme (IHDP) on Global Environmental Change, created for the generation of scientific knowledge with regard to integrated human-environment systems to "achieve comprehensive understanding of global environmental change processes and their consequences for sustainable development" (Schmidt & Rechkemmer, 2006). It will include the examination of human drivers of global environmental change, their impacts on human welfare and human responses to that change. The question has been raised as to whether an integrated global freshwater strategy is needed to answer the current challenges (Schmidt & Rechkemmer, 2006). This shows the increasing realisation of the intricate connections of water with the global challenges humanity faces today and the broad knowledge base that is required to deal with this.

An example of an existing broader approach to WM is that used by Austria, where individual elements link together to form a cohesive whole. A Water Charter (see section 9.2.1) is only one element of a broader sustainable water policy. This approach, although not yet fully *Water Centrality* compliant, could form a useful example for *Water Centrality*; it includes legal changes and the realisation of a necessity to increase "the population's appreciation of water and highlighting the significance of this essential and vital resource" (Lebensministerium VII/1, 2006c).

Austrian celebrations of the 2003 UN International Year of Freshwater included a number of water festivals (Wasserfeste) and other activities while activities on World Water Day 2006, with the motto 'Water and Culture', were designed to deepen the population's relationship with water by getting Austrians to increasingly think about water and become aware of their relationship to it (Lebensministerium VII/1, 2006b; c). The *Neptun Wasserpreis* (Neptune water prize), with its five categories that comprise emotions, protection, creativity, global and communication aspects, is also part of the ongoing awareness raising campaign regarding water (tatwort Gesellschaft für Kommunikation und Projektmanagement, n.d.), as is education for young people.

> Over the last years already, education has had top priority with a lot of young people, again and again, dealing actively with the subject of water. This is a motivation and an obligation at the same time to provide especially the young

generation with information tailored to their needs. … The aim is to bring water, in all its cultural, social, economic, ecological and political dimensions, close to young people. The respective project is called *"Generation Blue"* and is primarily available on the Internet (http://www.generationblue.at). (Lebensministerium VII/1, 2006b)

While the Austrians are not using the term 'water literacy', their approach is essentially aiming for it. Some of the ideas may be valuable for other countries, although there will be differences between communities and cultures how this would be done. As *Water Centrality* recognises, this is necessary and desirable since diversity is essential to account for local differences and to increase system resilience. Partly, such differences would also stem from the way water is used and portrayed in different languages.

8.3.2.2 The Language of Water

It is through language that we develop our thoughts, shape our experience, explore our customs, structure our community, construct our laws, articulate our values and give expression to our hopes and ideals. (Brock, 2006)

Since language is such an important aspect for *Water Centrality* and water literacy, it is worth exploring the 'language of water' in more detail.

There are many words and expressions in the English language (as well as in other languages) that are related to water or derived from aspects to do with it. This is obvious and expected with regard to water and other liquids, but, interestingly, also applies to electric power and money. The word 'water' itself appears to have two roots; one meant *animate* and referred to water as a living force while the other indicated an inanimate substance (Harper, 2001). This may still be reflected in Hinduism where there are holy water sources and those that can be used for mundane purposes (Singh, 2006).

The term 'currency' refers to a 'condition of flowing' or something being 'in circulation' and is derived from the word *current*: 'running', 'swift' and 'torrent' but also 'flowing' (Harper, 2001). Hence, 'water currency' seems to be a very apt term for an accounting system for water, with the meaning of currency as a 'medium of exchange or money' also fitting well. Other meanings of 'currency', such as 'state of being common or in general use', refer to what water actually is already, and 'general acceptance; prevalence; vogue' is what is needed for *Water Centrality*.

Another word also very pertinent to water is 'affluent'. It comes from the Latin *affluere,* 'flow towards', and has been used in the sense of 'a plentiful flow' of gifts of fortune in the sense of 'wealth' since the early 17th century (Harper, 2001). Interpreting the word in a *Water Centrality* sense can convey the message that water is the root of all wealth. Interestingly, the word 'fluent' originates from the Latin *fluere,* 'to flow' (Harper, 2001), indicating that proficiency in language can be related to water.

There are also many water sayings and proverbs (various collections are available on the Internet) and many terms, words and expressions whose origins are less obviously connected to water, that reflect the pervasiveness of water in our lives. It may be useful to promote these water words, terms and sayings, which is really a rediscovery of the water content in the existing idiom, and make the more hidden connections better known to enhance this awareness and assist the promotion of *Water Centrality*. Language may be instrumental in *Water Centrality* achieving currency and helping people realise how affluent we really are.

8.3.3 Other Considerations

There are other elements that need to be considered for the implementation of *Water Centrality*. Dinar (2001) has compiled a list of factors that are important for any reform. Timing is one of these, with times of crisis and the 'honeymoon period' just after a government has taken office being two of the most opportune periods (Dinar, 2001). Other factors include "the commitment of a strong government; the creation of an independent, dedicated, and professional reform implementation team; the use of the media to convey the reform messages; the use of alternative policy measures to allow for sustainable reform consequences; an efficient reform program leading to low transition costs; the implementation of safety nets for the poor and those who were ignored; and the introduction of compensation packages to those who may be hurt by the new policies" (Dinar, 2001 p.25).

> Country water reforms should be launched after extensive public awareness campaigns. A certain level of capacity for all parties involved is needed to be in place for implementation of reforms. This means that the implementation process should include also educational activities. Reformers should communicate a clear economic rationale, develop a broad agenda, adjust to institutional and political reality, and take account of traditional customs and social structures. Successful reform programs must include compensation mechanisms negotiated with stakeholders. Reformers should precisely identify their objectives. Reforms should be well prepared, because once they are implemented, they are hard to modify. (Dinar, 2001 p.25)

It is clear that many of these issues will come to bear, and will require thought and consideration, if *Water Centrality* should be implemented. For that eventuality, some practical suggestions for putting *Water Centrality* into action are offered next.

Chapter 9
Initiatives for Making *Water Centrality* a Reality

9.1 Introduction

In reality, implementing *Water Centrality* will be complex. Initiating the transition for the establishment of water as the centre of society, the *Water Centrality* Principles themselves provide guidance on how it could be achieved. Suggestions on how the principles could be translated into action are made without claiming to be the only possible or the best way to proceed.

The first principle calls for a strategic vision to provide guidance and inspiration promoting an ethical, water central approach based on broad consensus. A logical way to fulfil this principle would be by making a national commitment to *Water Centrality* at the highest level in the form of a *Water Centrality* Charter (WCC). Other WCP would have to be employed in the compilation of such a charter, especially Principle 2 – Participation and Voice, while the whole document would need to be fully based on and espouse all the WCP (see below).

While a vision in the form of a WCC would be a logical first step, other elements of *Water Centrality* implementation could be instigated in parallel. Any participatory process or processes employed to formulate the vision could be used to clarify issues of concern, such as institutional setup and procedures, and meaningful and ongoing participatory practice. The same processes could include activities that start compiling the review of the whole water/society system to uphold Principle 3 – Integration and Coherency.

Much of the implementation of *Water Centrality* and its ongoing success will depend on institutions that are suitably set up and operated. While Principles 5 to 7 explicitly refer to institutions and their operational aspects, the other four principles also provide useful ideas (see Chapter 5 or *Waterbookmark*). Other details would need to be decided upon with regard to individual or local circumstances.

Besides a changed institutional landscape, for *Water Centrality* to take hold fully and thoroughly, a general change in public attitude and values will be needed. Such

attitudinal change is at the root of *Water Centrality,* since it is the prerequisite for change in behaviour according to Ajzen (2006), and would have to precede then accompany its implementation. Although the WCP provide some broad guidance, details are lacking, which is desirable as the people themselves, being those who have to be inspired, emulate and live by the results, need to be fully involved in shaping the large changes that are integral to *Water Centrality*. This can be where decisions are made or ideas emerge that substantially modify *Water Centrality*, even to the extent of contesting the principles. While this may be the end of *Water Centrality* as proposed, it would still be a desirable outcome insofar as it would reflect the community's ideas, provided they were arrived at in a deliberative, participatory and equitable process.

Assuming broad support for *Water Centrality* as a given, the following sections deal with three of the most important aspects of *Water Centrality*: the vision, the institutional landscape and values changes. These aspects can be seen as being representative of three levels: an 'overarching' constitutional and guiding level; an 'intermediate' governance level that is concerned with facilitation and implementation; and an 'underpinning' level that concerns community-wide beliefs and values that encompasses the whole philosophy. These levels provide the framework to answer the following question before summing up:

- What initiatives may be useful for implementing *Water Centrality*?

9.1.1 Water Centrality *Charter (WCC)*

In a federal system, such as Australia, the highest level at which a directive, rule or declaration can be enshrined is in a constitutional document (Saunders, 1995). A constitution represents the overriding law of a country, prescribes the institutional setup and its own review mechanisms (Saunders, 1995). Arguably, this would be the appropriate level for enshrining *Water Centrality* since it would affirm its central position and could provide for the consideration of its principles throughout society. Depending on the wording it could be more or less prescriptive and could be made to fit the situation at hand. However, writing a constitution is fraught with many difficulties and not something that is done easily and lightly (Saunders, 1995).

In practice, a constitutional amendment would be more likely in Australia, although past attempts to that effect have rarely led to success (Saunders, 1995). If successful, a constitutional amendment would give *Water Centrality* the status of law and clearly confirm public support for the concept since it requires a double majority in

a popular referendum (Commonwealth of Australia, 1997; Saunders, 1995). A weak point would be that the effects would be restricted to the state and federal levels, since the Australian Constitution is silent regarding local governments (Saunders, 1995).

In light of the latter, and considering the complicated process as well as the considerable cost a constitutional amendment would incur, another possibility would probably be more suitable; that of a national charter, either attached to the constitution or as a separate entity. Such a *Water Centrality* Charter (WCC) would provide more flexibility for future changes if required or desired, and could be a more inspirational medium to embody the aspirations and values of society. It could hold equal status with the constitution itself, which, were this to occur, would provide guidance at the individual level and would be most conducive to embedding *Water Centrality* in every government department, organisation and business, local government, school and educational institution.

At this date, no *Water Centrality* Charter exists anywhere in the world but there are existing initiatives that may be informative; examples of which are presented in the following section.

9.1.1.1 Existing Water Charters

Water charters have been adopted or are being developed in various countries and regions or by groups around the world. They are prepared for different levels (from global to local) and vary in their intentions and scope.

An example of an existing national water charter is the Austrian 'Rot-Weiss-Rote Wassercharta' (Red-White-Red[47] Water Charter), which was signed by the environment minister and other politicians at the federal and state level (Lebensministerium VII/1, 2006c). It was published in May 2004 by the federal 'Lebensministerium' (Ministry of Life) and summarises the goals for water management in Austria in ten points (Lebensministerium VII/1, 2006a) (see Box 9.1).

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[47] The colours of the Austrian flag are red, white and red

Water Charter: The Guidelines for our Water Future
Our Water – Our Future

1. Austria – a country rich in water
Our water is an irreplaceable treasure: We must employ all our efforts even today in order to safeguard tomorrow's water supply and water quality. At the federal, provincial and municipal levels: among politicians and ordinary citizens, and among industries and consumers.

2. Water creates a good quality of life
It must be the goal of our policy to ensure that plentiful sources of fresh, pure water remain available everywhere. Water must remain affordable.

3 Water needs protection
We remain committed to uncompromising purity of our country's lakes, brooks, and groundwater also in the future.

4 Protection needs sustainability
In order to protect life and reduce damage, we must create more areas for flood discharge and retention. The only effective protection against floods is a sustainable form of protection.

5. Water needs room
We need to give our rivers and brooks more space to flow. By means of an ecological orientation and by renaturation we can also reach again a new quality of the "living environment" water.

6 Water is growth
We need to make intelligent use of the potential of our water as a valuable resource for nourishment, tourism, regional development, sustainable generation of energy and transportation.

7. Water creates opportunities
We have to make active use of the internationally recognised know-how of water technology "made in Austria". The enlargement of the EU offers new market opportunities to Austrian high-tech providers of environmental technologies and services.

8 Water will remain red-white-red
Austria will continue to make independent decisions about its water resources.

9. Water needs a home
Water must remain a core competence of our municipalities. A strong regional water management industry is the best guarantee for the future.

10 Water needs responsibility
We must be sparing with our water resources. We all must make our contribution in everyday life.

http://www.wassernet.at/article/articleview/37004/1/6374

Box 9.1: Red-White-Red Water Charter of Austria (Lebensministerium VII/1, 2006c)

At the 3rd World Water Forum in Tokyo in 2003, the world's ministers made a water declaration (see Box 9.2) in which they announced the intent of producing a future water charter in the spirit of the declaration (Secretariat of the Ministerial Conference of the 3rd Water Forum, 2003). At the time of writing this thesis no charter had been drawn up.

"Water Declaration"
We have discussed issues concerning water and water resources in a program entitled "Water and Parliamentarians" at the 3rd World Water Forum. We have reaffirmed that we share the following knowledge.
1. Water is essential for us to maintain our lives as well as socio-economic activities such as agriculture and industry. The quantity of usable water is very limited. As a consequence of us humans contaminating water, the quality of water is in crisis.
2. Geographically, usable water is unevenly distributed, and thus this water has become one of the major causes of friction and conflict within and outside countries. As called for by the 1997 United Nations treaty on international waters, shared views and actions among all the countries including both upper and lower basin countries in the management of the water of international rivers, lakes and aquifers are necessary. For this purpose, governments, international organizations, NGOs, civil society, the private sector and all concerned parties need to solve water problems and protect water, which is a part of the environment. In addition to respective governments, international organizations especially play an important role in this regard.
3. We, the legislators, are among the most important and responsible actors who are in a position to solve water problems and who also work directly with governments towards that end.
Based on the above recognitions, we firmly declare and pledge to enact the following swiftly to secure limited water resources for us in the future:
1. To help our respective governments recognise the importance of having water and stable water resources, of taking appropriate measures towards that goal together with our citizens, of establishing a social system of its fair distribution, and of establishing environments where people can access safe water within our respective countries, while maintaining links between the central and local governments;
2. To propose to our respective governments that they enhance scientific knowledge, and promote dialogue based on the shared knowledge with other basin countries and establish a mechanism for solving the problem of crossborder water resources by utilizing international organizations, integrated water resources management systems, and other means; and
3. To propose to our respective governments, which shall work with the United Nations to draft a future "United Nations Water Charter" based on the spirit of this "Water Declaration," to reaffirm the importance of water resources and to secure its sustainability; and to work with our respective governments to adopt the "United Nations Water Charter" to be presented to the United Nations.

Box 9.2: Water Declaration by the World's Ministers at the 3rd World Water Forum in Tokyo (2003)

Other 'water charters' are clearly aimed at the more local level and have a narrower scope, but could be useful starting points or stepping stones in the development of higher level WCCs in their respective regions, states or countries. Examples are a water charter for the Camargue delta in southern France developed to improve water management, which may become legally binding (Parc naturel régional de Camargue, 2003), and an initiative between a home builder and the local and state governments in Wisconsin that aims to reduce stormwater runoff and erosion through the so-called Green Tier Clear Waters Initiative (GTCWI) (WDNR, 2006)

In Australia, an initiative by the Victorian Women's Trust called 'Water*mark* Australia' has encouraged people to form groups to become educated about water. Based on feedback from these discussions, the book *Our Water Mark* was produced in 2007. It contains informative and educational material about water and water use in Australia as well as ways to achieve water efficiency in different sectors (Victorian

Women's Trust, 2007). The book's '20 Principles Guiding Water Reform' (Box 9.3) are based on the community group's reports and workshops with scientists. These principles are designed to help Australia meet its water challenges (Victorian Women's Trust, 2007).

The Way Forward: 20 Principles Guiding Water Reform
THE FUNDAMENTALS
1 Access to clean **fresh water** is a fundamental **human right**.
2 Water has an **intrinsic value to humanity** and all living things irrespective of commercial considerations. This fundamental value must be safeguarded by our political, social and economic institutions.
3 Our fresh water is a common good, **shared by all, and held** in public trust by government.
4 Creating the conditions that ensure **access to water to meet the essential needs of every person, every community and all living things** is an obligation on society as a whole.
5 In meeting these essential needs, **public health must always be protected; and social cohesion, rather than polarity, should be nurtured and maintained.**

KNOWLEDGE TO GUIDE ACTION
6 The decisions that need to be made about water **have to be taken right now by us, at this moment in time,** and not left to some future generation.
7 All people should have the opportunity to **participate in the debates and decisions about water** that will affect their lives and livelihoods.
8 Rural and urban Australians are tightly connected by the water that is used to produce our food and fibre. **The responsibility for reaching sustainable water use, and the investment that will be required, is a shared one.**
9 We should seek to understand the land in which we live and appreciate its variability, limits, ecological processes and their timelines. **Improving and extending our water literacy is an essential step towards achieving a sustainable water future.**
10 To remain **living things**, our rivers and streams **need to get the first drink**. Once this need is satisfied, water can be allocated for other purposes.
11 We should always respect **the linkages between surface water and groundwater**, ensuring that neither is wasted or contaminated.
12 We should seek to **reuse water as many times as possible**. At the same time, we should aim to **minimise adverse environmental impacts and maximise the social and economic gains from its use**

GOVERNMENTS' ROLE
13 Governments have a particular and enduring responsibility to provide wise stewardship of the nation's water resources.
14 Governments in a market economy have an enduring responsibility to act as a balance to market forces in the management of our water resources.
15 Governments should act as committed and independent regulators of water use, taking into account urgency, social impact, fairness and community expectations.
16 Governments have a responsibility to measure, monitor and report regularly on how water is being consumed and by whom, how the environment is being provided for and how communities are moving towards the sustainable use of water.
17 National and state government programs on water reform must be underpinned by appropriate public inquiry and consultation as well as being transparent, technically sound and socially and economically responsible.

WHAT IT WILL TAKE
18 We need to accept and **share the significant medium-term financial costs** that will be required to achieve wise ad efficient water use.
19 All sectors of society should be prepared to rapidly adopt **appropriate, proven water-saving technologies and actively support further innovation.**
20 Each of us has a responsibility to leave society and our environment in better shape than we found it.

Box 9.3: The Way Forward: 20 Principles Guiding Water Reform (Victorian Women's Trust, 2007 pp. 96-100)

While this initiative was participatory, it is unclear how much government support it has, or will be receiving. Nevertheless, the principles and the people who were involved in the original deliberations could form a valuable basis in a future WCC process in Australia.

Once a WCC exists it would need to be translated into practice at all levels of society, which means that each person has an important role to play in his or her sphere of life, and institutions and processes are required that support and facilitate in addition to regulating these activities.

9.1.2 Governance

> In recent years, the notion of government as the only decision-making authority has been replaced by multi-scale, polycentric governance, which recognizes that a large number of stakeholders in different institutional settings contribute to the overall management of a resource. (Pahl-Wostl, Craps et al., 2007 p.1)

The mandate of *Water Centrality* is quite clear, everybody has rights and nobody can shirk responsibility. The WCP plainly identify the premises on which *Water Centrality* relies and offer a cohesive and comprehensive framework on which policies and processes, institutions and, in fact, the whole of society can be based. *Water Centrality* as a multi-dimensional approach should be able to promote flexibility and reduce compartmentalisation. Water as a unifying element should also help in overcoming intellectual and institutional barriers. It is also anticipated that lack of trust can be addressed through the open, inclusive and transparent processes that are promoted by *Water Centrality*, which may help build this important 'resource' over time. All these claims still require validation, but based on personal experience in the Western Australian Water Forum in 2000 and judging by the outcomes of the Water*mark* Australia project, this may be possible to attain through research based on similar community events. Such initiatives could be based on the WCP from the outset, including their design, testing their applicability continually.

The *Water Centrality* Instrument, as an extension of the WCP, aims to clarify points and issues for use in a variety of applications. These include assessment of existing policies, plans and projects, institutions and processes as well as the design of new water central versions of these. The WCI can also serve as a basis for the design of new instruments, and can assist in decision-making and other processes. The full

instrument could be abbreviated into a standard checklist (see *Waterbookmark*) and consulted every time a decision is made in any appropriate circumstance.

9.1.2.1 Theoretical Considerations

Water Centrality, as a deliberative approach, and with it the WCP and the WCI, could be regarded as communitarian on the political theory spectrum; it is based on values and marked by cooperation, equity, cohesion (Adams & Hess, 2001) as well as fairness (Etzoni, 2005). The elements of community decision-making and consensus as well as local connections (Pritchard & Sanderson, 2002) are also represented. In addition, *Water Centrality* concurs with the communitarian approach to policy making and implementation in that it challenges state democratic and market capitalistic perspectives in a variety of ways, among which are changes to the temporal and spatial timeframes, ideas of integration and interdependence, collaborative learning, mutuality and risk sharing (Adams & Hess, 2001).

Elements of a version of deliberative democracy called 'strong democracy', which is based on "classical theories of community, civic education and participation" (Barber, 2004 p. 118), could be valuable for *Water Centrality* because it:

> …envisions politics not as a way of life but as a way of living – as, namely, the way that human beings with variable but malleable natures and with competing but overlapping interests can contrive to live together communally not only to their mutual advantage but also to the advantage of their mutuality. (Barber, 1984 p.118)

Water Centrality also:

> …aspires to transform conflict through a politics of distinctive inventiveness and discovery. It seeks to create a public language that will help reformulate private interests in terms susceptible to public accommodation; and it aims at understanding individuals not as abstract persons but as citizens, so that commonality and equality rather than separateness are the defining traits of human society. (Barber, 1984 p.119/120)

The main distinction between 'strong democracy' and *Water Centrality* is the, arguably, more tangible base in the form of water, which may also be useful in addressing some of the criticism regarding communitarianism.

Several concerns have been raised regarding a communitarian approach: that it is widely used but not clearly defined and tools and instruments may not be developed

sufficiently to enable implementation (Adams & Hess, 2001). Other considerations are that not all communities are good and that not all values on which communities are based are good *per se*. There can be disagreements about these points, which need to be resolved otherwise communitarianism risks becoming a fad (Adams & Hess, 2001). Solutions have been suggested by using a combination of ethics and sociology (Etzoni, 2002). Focussing concern on an object that is not human but at the same time is of central significance to humans, and in many instances defines communities (Strang, 2004), may also help provide solutions.

Other potential problems that communitarian approaches are faced with include manipulation and intimidation, or issues of social proof[48] that can plague deliberative processes, and loss of attention or engagement especially in complex and less threatening situations (Pritchard & Sanderson, 2002). 'Innocence of politics' is another criticism, where communal decision-making potentially "demeans the formal political process and seeks to depoliticise local discourse, as if it were not political at all" (p.161), which can result in formal political processes being regarded with hostility with a resultant loss of community power, (Pritchard & Sanderson, 2002).

These issues may be more difficult to overcome, but no political system or approach is without problems. It may be useful to realise that "we are on a sharp policy learning curve and therefore [need to] approach community in an heuristic manner with a view to policy-oriented learning rather than quick-fix solutions" (Adams & Hess, 2001 p. 21/22). Social learning could be a useful approach (Pahl-Wostl, Craps et al., 2007) to find solutions, while it is envisaged that the WCP can provide an heuristic approach or at least the basis for one. The WCI can be a tool for the more practical applications.

There are elements in *Water Centrality*, such as the provision of Human Rights, which are upheld by political communitarians, and attention to economic efficiency that are not communitarian as such. Above all, the most distinguishing feature of *Water Centrality* is the recognition of the primary importance of water; all other elements, including those pertaining to community, community capacity and decision making, are there to support, enable and realise this primacy. In short, *Water Centrality* can be interpreted through political philosophy and theory, but it also transcends them since it

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[48] In situations with limited information people tend to follow a leader (Pritchard & Sanderson, 2002)

goes beyond, or beneath, to a much more fundamental concern, that of utter dependence on water.

9.1.2.2 Institutional Setup

There is essentially a choice between a slow phasing-in of *Water Centrality* with the associated slow, incremental demise of the existing governance system and an abrupt, total replacement of the system. In the first scenario, existing institutional set-ups would be kept, at least initially, with only their decision-making processes adjusted to include *Water Centrality* questions (taking the WCP as a base). More far-reaching changes would emerge over time and flow on into legal, institutional areas and other adjustments, as appropriate. This would be consistent with the argument that existing management systems should be strengthened rather than replaced or recreated (Rhoades, 2000) as well as with experience in some developed countries (e.g. US, France and the UK) where a single water management unit was most successful in achieving multiple outcomes (UNESCO-HELP, 2004).

There is a danger that this approach could lead to a 'watering down' of the intentions of *Water Centrality* and, as with sustainability, a continuation of current practice or 'business as usual' with only minor changes could ensue. A single water management unit also may not be the most appropriate structure for *Water Centrality* since it may perpetuate or even exacerbate the existing sectoral separation and preclude the thorough integration of water in all institutions and decision-making processes as well as the higher level of involvement required by *Water Centrality*.

Centralised management may be unsuitable for water and better replaced by cross-scale approaches that link institutions horizontally as well as vertically and are planned 'bottom-up' to achieve local solutions. A combination of informal and formal as well as 'top-down' and 'bottom-up' negotiated, facilitated approaches has been suggested for use in water allocation (Molle, 2004). The greater success in operationalisation and implementation through such approaches that involve stakeholders, localised solutions, increased compliance and conflict reduction (Molle, 2004) would suggest that negotiation and collaboration should be preferred in *Water Centrality* institutions.

Water Centrality institutions would be structured differently from those currently in existence and replaced or adapted to be much more participatory, flexible,

adaptive and transparent with water as a focus of decision-making. An internal cross-sectoral approach would embed water in each and every government department and also in other organisations, private and public. This could be done in the form of a *Water Centrality* policy and/or a 'water section' in each organisation that would enshrine consideration of water and *Water Centrality* in decision-making throughout, using the WCI or derivate as a guide. Initially, this could occur in any existing organisation without immediate total restructuring, although more fundamental changes in line with the WCP would be necessary over time. The WCI could then be used as a restructuring guide.

Social learning would be well suited to such an institutional setup (see section 8.3.2). Adaptive, collaborative institutions require a way of dealing with information that allows them to learn and deal with uncertainty and change on many different levels with a number of participants in an effective manner; social learning provides such an approach (Pahl-Wostl, Craps et al., 2007). In fact, social learning and adaptive institutions go hand in hand. Institutions are required to provide a level of stability and certainty but at the same time facilitate processes in which "stakeholders at different scales are connected in flexible networks that allow them to develop the capacity and trust they need to collaborate in a wide range of formal and informal relationships ranging from formal legal structures and contracts to informal, voluntary agreements" (Pahl-Wostl, Craps et al., 2007 p.1).

The stage-based approach to institutional change proposed by Saleth and Dinar (2005) may be useful and could be explored further. The interactions of mind change, perceptive convergence and political processes in institutional change may be of particular interest. Mind change was identified as instrumental in achieving perceptive convergence that leads to demands for institutional change, which is followed by a political process of debate and negotiation before the parameters for the change are agreed upon.

It is to be expected that this would not be an easy process and that the outcomes would vary considerably between countries and cultures (Molle, 2006b). "Institutional research, as it relates to water resources, has unfortunately been negligible in the past decade or two at a time when new and innovative institutions will surely be [needed as] part of the solution to the world's emerging water problems" (Jury & Vaux, 2005

p.15719). This oversight could be redressed through supporting the implementation of *Water Centrality*.

The institutional restructure process could be supported externally through a constitutional-level initiative, that is, the WCC (section 9.2), which would instigate, display and promote an overall adjustment of worldview with regard to water values and provide the necessary vision. The proposed internal restructure would also be part of a general revaluation of water that would be necessary to make *Water Centrality* work fully.

9.1.3 (Re)valuing Water

Acknowledging water as being central to society would mean the revaluation of water in society and the full acceptance of all the values of water. Water would be valued not only as a resource but also, predominantly, as a special substance that has life-giving, cultural and spiritual meaning. This cannot be achieved through pricing or trading, although initially these elements may be useful for some values. The role of water would have to be made visible and dominant wherever possible.

> We need to find ways for valuing water from all different aspects – socially, economically and ecologically – in order to make better choices in the beneficial utilisation of green as well as blue water resources. (SIWI et al., 2005 p. 3)

Central to this would be a general increase in 'water literacy', encompassing knowledge and awareness of water in all areas of life. Principle 9 of the Water*mark* Australia project specifically calls for this (Victorian Women's Trust, 2007 p. 97). In *Water Centrality*, knowledge improvement and compilation are embedded through a whole water system review and ongoing search for knowledge (WCP 4.1 and 5.2) while the creation of a WCC (section 9.2) would be an important part of, and guide for, educational and awareness raising initiatives.

Language would play a key role in water literacy and existing terms and sayings could be used to advantage (see section 8.3.2.2). Another way of raising awareness could be through the establishment of a 'water currency'.

9.1.3.1 Water Currency

A 'water currency' would be an accounting system based on water. A suitable scheme would have to account for the different characteristics and requirements of

water and ideally should not be tied to money and speculative markets. This may be difficult to achieve since incentives are often financial. However, since economics and the fiscal system are considered by many to be part of the present woes of the world it may be time to entertain the idea that water could replace money as currency and so aid in the 'healing' of the planet rather than in its destruction.

That does not mean that quantification is not required. A water currency system would need to be based on the total amount of freshwater available on the planet (using best estimates). This would include identifying where that water is located by country or region and by form, i.e. water bodies (including groundwater aquifers), frozen water, vegetation cover and animals (including humans), as well as soil water and vapour. Fluxes would have to be calculated, i.e. how much water is moved around in these systems through evapo-transpiration, precipitation and industrial, agricultural and urban processes. This inventory of the whole water system, as asked for in the WCP, would be in flux itself, in need of constant updating as conditions change (as they are bound to do with continuing global climate change).

> The water system includes the water cycle and three major interacting elements: the physical, biological and biogeochemical, and the human components. Major drivers of change that affect the system are climate change, population growth, land cover change, the development of water diversions, economic development, and governance. Changes in any component of the system will cascade throughout the whole system. (Craswell, 2005)

An important element for success would be to identify all the uses and functions of water as well as the amounts that are used, and/or polluted, in the production of goods and other processes. For example, the SIWI (2005) has proposed food labelling that relates nutritional value to amount of water used in its production. The information should be extended to all other goods and services and include not only the amount of water 'used' but also its degree of pollution.

The ongoing accumulation of data and knowledge in the Global *Water Centrality* Database would provide this information because all existing water information would be identified through monitoring and effectively provide for optimal international cooperation.

There are good examples of water resource accounting or review (e.g. Australian Bureau of Statistics, 2006; Balonishnikova et al., 2006; Government of Western Australia, 2007) but so far they have paid limited attention in accounting for all the

interconnections of water. For example, water and energy are closely connected, both through the use of energy in the provision of water for households and industry, which includes bringing water to potable or industry standards (e.g. by filtration, disinfection and other treatment or desalination) then transporting it to the end user (infrastructure such as pipelines and pipes and transport via road or ship). Providing water for irrigation, which often requires dam building as well as maintenance of channels or pipes and/or pumping of water, incurs considerable energy use. The often substantial losses through inefficient irrigation techniques, canal leakage and evaporation increase this use of energy. Since energy production at this time is predominantly reliant on fossil fuels, the associated output of greenhouse gases is of concern due to its potential effects on the climate and the water cycle.

Substantial amounts of water are used in the production of energy, either directly through hydropower plants or as cooling water in other energy production units (e.g. coal-fired or nuclear power plants). This not only removes water from natural systems, changes flow regimes and precludes other uses, but it may lead to thermal and other contamination with pollutants, including radioactivity. Such interconnections need to be fully considered and included.

> Research is needed to clarify the magnitude and mechanisms of change, and how society can best adapt to the system state changes. We need to develop condition indicators such as water availability per person, the water poverty index, pollution concentrations and source water quality. Also on the research agenda are new concepts, namely: blue and green water and environmental flows; virtual water in agricultural trade and associated nutrient flows; and the water systems discourse to integrate natural science and social science approaches. (Craswell, 2005)

Some techniques are available to do this, e.g. total exchange of water vapour can be measured reliably through eddy co-variance (Grace, 2004), and volumetric measurement of liquid water seems to be well established, while other techniques may have to be adjusted, designed or invented.

The idea is to identify ecosystem demands so that sufficient water is available to ensure their ongoing function and health, which then determines the amount of water available for other, human, uses. Some uses, especially those associated with ecosystem services, such as water clarification and filtration, as well as recreation and aesthetic uses overlap with ecosystem demands, which would also have to be accounted for. The remaining water for human uses then needs to be quantified and allocated equitably.

In Australia, a start has been made in the form of an ABS initiative called *Water Account, Australia* with its latest edition summarising the supply and use of water for the period of 2004-05 (Australian Bureau of Statistics, 2006). The account was compiled using the System of Integrated Environmental and Economic Accounting (SEEA), instigated by the United Nations in 2003 which was then developed further into the System of Integrated Environmental and Economic Accounting for Water (SEEAW) in 2006 (Australian Bureau of Statistics, 2006). The NWI will require the compilation of annual water accounts (COAG, 2004b).

The calculation of water transfer as 'virtual water' (Chapagain & Hoekstra, 2004; Kumar & Singh, 2005) looks useful for determining the movement of water through goods and products, but so far it appears that it is only applied at the country level (Chapagain & Hoekstra, 2004). The associated 'water footprint' (Chapagain & Hoekstra, 2004; Kumar & Singh, 2005; UNESCO-WWAP, 2006) could be a useful and educative tool but would have to be broadened (and made more specific) so that it not only provides information at a national level but also at a regional, local and household level, as well as for individual goods, products and services.

It would also have to be expanded so that all products and processes have a 'water (credit/debit) rating' attached to them. This information would be useful to consumers and other decision-makers for use in coming to decisions. It would also be an educative tool as well as an awareness raising mechanism, bringing to mind the impacts on and connections with the water system of all goods and services at all phases of encounter. This 'water labelling' or 'water rating' could then aid in decision-making at the consumer and the producer level, as well as at all levels of government, other institutions and organisations.

The beginnings of such accounting have considered water and wastewater as part of 'ecological footprint' calculations (e.g. Chazan, Talberth, Shah & Lowe, 2005). In this case, the water footprint signifies the water use and discharge (effluent, grey water as well as stormwater runoff). So far, there is no widely accepted method for calculating water consumption, though Chazan et al. (2005) calculate the energy requirements of supplying clean water which is then transformed into a CO_2 footprint. For wastewater the area of wetland required to purify all the discharge is used. Both methods are acknowledged as being placeholders awaiting more formal peer review (Chazan et al., 2005) or more appropriate methods.

In the considerations of wastewater it may be necessary to include the type of waste the water contains. Certain biological and chemical substances, such as those that are difficult to break down, are highly poisonous or have undesirable biological effects (e.g. pharmaceuticals), should not enter the environment at all or if allowed, at very low levels. So it may be useful, if complex, to take the pollution potential of a substance into account in water accounting while ensuring that these substances do not enter the environment and are treated accordingly (which would incur a financial cost as well).

While the details of such a water currency system have yet to be finalised there are some existing credit systems that may provide some useful insights.

9.1.3.2 Existing Water Credit Systems

A variety of water credit systems has been suggested, either to improve water allocation and reduce water conflicts (*Draft Summary: Workshop on Climate Variability and WRM*, 1997), to help reduce water consumption or change behavioural norms with regard to water consumption (Peachey, 2004), or as part of sustainable building assessments to reduce the water footprint of a building (Building Research Establishment, 2006).

In the USA, there are water pollution credit systems or markets run by environmental protection departments. Water quality trading information and resources to set up water quality trading schemes are available from the US EPA (US EPA, 2007b). A number of these schemes are in operation or in development throughout the US, some state-wide and others watershed-based. There are different types of trade, based on pollution source, and different pollutants that can be traded. Maps and information on trading arrangements are available online (US EPA, 2007a).

Some municipalities also offer stormwater credits in cases where stormwater is retained on the premises or runoff reduced or stormwater quality improved because of reduced sewer loads (Murray City Corporation Public Services, n.d.). 'Water credits' also called 'sewer credits' can be given by water utilities to customers for water that has been applied by sprinklers and used to fill pools since it did not enter the sewer system (e.g. City of Hoover, 2006; Town of Holly Springs, n.d.).

A number of 'water credit' schemes have been or are operating mainly in developing countries on the basis of micro-financing facilities and infrastructure for water supply or irrigation schemes. In 2006, a credit system for green water has been

instigated in the form of a Payment for Ecosystem Services (PES) scheme that pays farmers for (green) water management activities (that manage soil water and reduce erosion) that are otherwise not recognised (Grieg-Gran, Noel & Porras, 2006).

In 2003, a tradable water credit scheme was proposed for Sydney, modelled on carbon credits, in order to reduce water consumption and increase water recycling. Under the scheme, the Sydney water utility would be penalised if it failed to meet demand management targets but it was envisaged that private sector investments would be encouraged for firms that offered water saving or recycling alternatives (Davies & Peatling, 2003).

While some of these schemes may be worth considering in *Water Centrality*, other initiatives would probably not be suitable. Most of them are based on markets or monetary value alone, not able to include any more intangible values while others even encourage water use. Carbon trading is also a monetary approach and it is unlikely that a water currency system modelled on carbon trading would be successful or even possible. It may also not be desirable given some of the criticism of carbon trading and carbon offsets that highlight many associated issues and problems (e.g. Lohmann, 2005; Van Kooten, 2004). However, it may be worth taking a closer look for two reasons: to avoid some of the pitfalls for a water-based system and the importance of a reduction in greenhouse gas emissions for the water and climate system.

Some recent proposals, such as tradeable personal carbon offsets, voluntary markets (Taiyab, 2005) or a carbon bank (Esuola & Weersink, 2006) may have the potential to make carbon trading more accessible and cheaper, but although such initiatives may help to reduce carbon emissions neither they nor carbon trading on a larger scale address the real underlying issue: ongoing production and emission of unsustainable levels of carbon, which can only be addressed through a reduction in use of fossil fuels (Grace, 2004; Van Kooten, 2004).

Increasing interest in a carbon market seems mainly due to economic reasons. This has put carbon firmly on the agenda and has raised awareness of the issue of global climate change. The Stern Report (Stern, 2006) with its focus on economic effects of climate change is a case in point. Given this preoccupation with economics, the question is whether there is any chance of raising awareness and interest in water without economic incentives and the lure of profit. It seems unrealistic to call for the removal of

money as a currency (at least in the short-term); however, what would happen if there were a parallel currency, that of water, that would have to be considered in trade, commerce and other decisions?

As outlined, existing water credit schemes or trading initiatives have been limited and mainly based on monetary value and incentives, so the challenge is to broaden or replace them to reflect the total value of water. This may prove difficult but is necessary for *Water Centrality*. Given the existing water credit schemes it may be useful to name the new initiative differently; 'water currency' seems most appropriate. Such a descriptive name could also help to perpetuate the 'language of water' (see 8.3.2.2).

Eventually, such a water currency could be the basis of a new economy, one that is based on water. The scenarios explored in the WBCDS *Water Scenarios*, particularly those relating to a 'hydro economy', would be worth exploring further in this context. However, detailing these many more far-reaching changes cannot be part of this thesis and will need to be addressed at another time and in another forum.

9.2 Outlook

It is hoped that the proposed idea of *Water Centrality* may offer a solution to the universal water management problem or at least provide food for thought on the way to finding one. *Water Centrality* would have wide-ranging consequences for all aspects of human activity and endeavour which may make it controversial and difficult to accept, but the increasing water crisis together with the ongoing decline in environmental and social quality may require a radical solution.

To be fully operational, *Water Centrality*, eventually, would need to be global since the water system is global. There are some attempts at global water management, or at least at conceptualisation and data collection (e.g. various UN initiatives and organisations, the IWI, etc.), however, so far there seems to be limited support and acknowledgement from national governments, without which these initiatives have insufficient effect.

Following the Stern Report on the economic costs of global climate change (Stern, 2006) conditions should be much more conducive to promoting new ideas. While businesses and economic leaders may be struggling with the implications of the report, forcing some to rethink their fundamental assumptions, it may be the right time to encourage them to think even further. Undoubtedly reorganising the economy and business around water would be more involved, but now that there is acceptance that the environment, at least as far as the climate is concerned, is a fundamental asset and prerequisite for the economy, it does not seem to be an unachievable step to make the connection to *Water Centrality*.

A recent publication by the Wentworth Group of Concerned Scientists (2006) strongly highlights the concern about the effects of climate change on Australia's water resources. However, instead of taking the opportunity to propose a change in attitude the paper endorses markets as the main solution to the problem of increasing water shortages and reduced rainfall and praises the NWI, asking for speedy implementation. The request to adapt the markets to incorporate environmental externalities to reflect full cost and for the government to buy back water for the environment in over-allocated river and groundwater systems gives an indication of some of the problems associated with markets. It seems unwise to insist on a flawed concept as a primary solution if problems can be anticipated for which solutions are difficult to instigate.

A New Matilda publication on environmental policy (McAlpine, 2006) connects the values outlined in *Our Common Wealth* (New Matilda, 2006) – freedom, citizenship, ethical responsibility, fairness, and stewardship – with the characteristics of the environment. McAlpine argues that the environment needs to have prominence in policy since it is the basis for much of our economic wealth and growth and that it is deteriorating, leading to the increasing costs of avoiding, rectifying, substituting and adapting the longer we wait for action, and that inaction may be fatal. He mentions water as the first environmental challenge while acknowledging that it "is part of a very interconnected system" requiring management on this system basis. But here, again, pricing is recognised as a key element and property rights are seen as crucial, although the author recognises the importance of cooperation in cases "where water should be managed as a commons to ensure that it is accessible to all". Besides water, biodiversity, energy, waste, people and coasts are the other key challenges he selected (McAlpine, 2006), which all, arguably, depend on or influence the availability of water and the health of water cycles; in short, are also closely interconnected with the water system.

Although this publication has a more holistic outlook, it still cannot divorce itself from making water subservient to economics. The reference to managing water as a commons is limited to instances where it should be available to all without specifying when this should be the case (McAlpine, 2006). While policy recommendations seem generally sound – referring to decision-making on a systems basis, resilience building, precaution and living off income not capital, accepting shared responsibility, efficient use of materials and energy, minimisation of pollutants and waste as well as a low risk approach – the call for the valuation of all environmental services (while recognising the 'un-valuableness' of some factors) and the establishment of markets for environmental resources and services seems counterproductive. The call for the internalisation of environmental externalities cannot remedy this, not only because it is unclear how this can be done. Different accounting practices in order to achieve full sustainability may be more what is needed (McAlpine, 2006).

Since the governments of Australia have agreed to the NWI and it is now in force, there are either the options recommended by the Wentworth Group of Concerned Scientists (2006), which include strengthening of water markets, or the water preferable option of rethinking the NWI, reducing the reliance on markets altogether and approaching water management in a holistic manner. Water as an elementary life-giving

substance should be treated with more respect. It is time that all Australian governments use their mandate in a co-operative, comprehensive project to achieve fundamental change in outlook and management of water for the good of the country and its people.

There are many different ways and activities conceivable, and *Water Centrality* is one of them; more will emerge in the process of developing strategies and solutions. It can be stated with confidence that motivated people are more creative, and motivation should rise with the increasing pressure from water shortages, therefore many new and exciting ideas should emerge.

So far, the current *Water Centrality* proposal has been well received, however, once presented to a wider audience it may be seen by some as ridiculous, naïve or misguided, unachievable, unworkable or otherwise undesirable. This is unavoidable, as with any new, over-arching idea, but it is hoped that the merits of *Water Centrality* will be recognised and its ideas will be used as a basis for a different approach to water management (and a new society) or at least its presentation will give new impetus to solving this conundrum. Ideally, *Water Centrality* will be implemented and the multiple benefits that it promises can come to fruition.

> However, the big question is if we can adapt our ideas and values quickly enough to make the necessary changes in our communities (Grant et al., 1996).

9.3 Epilogue

"Water is life" or "water is central to life" are truisms that nobody disputes, which makes it all the more disturbing to see how little these statements seem to be taken seriously and how often they seem to be disregarded altogether. One of the main realisations through the research for this thesis has been that human relationships with water are often limited and flawed, associated with a lack of understanding of the (inter)connectedness of humans and nature with water.

In my experience, this stems chiefly from limited knowledge about water itself, of how truly remarkable this substance is and the many functions it has, about the water cycle and all the intricate interactions at all levels, from the molecular to the universal. In addition, people seem to have learned to be cautious towards their intuitions and their emotions, otherwise they would perhaps take their innate connection with water more seriously. This then results in a lack of awareness of how much each of us, personally, is affected by water and influences what happens to it. Potentially, *Water Centrality* could help address these shortcomings.

In writing this thesis, my original purpose, the identification of social water requirements, has been subsumed as well as superseded at the same time. While I have not actually provided a solution for water managers regarding SWR, I have managed to incorporate the psychosocial aspects in a holistic approach to 'water management', thus effectively eliminating the need for a separate process. *Water Centrality* may not be able yet to address all the practicalities that water managers are faced with but it can provide a new framework in which new questions can be posed, and, hopefully, answered.

Although application of *Water Centrality* would need to occur at all levels, from government to the individual, the latter seems crucial, because any activities and initiatives at other levels can be undermined if people do not concur (Medema & Jeffrey, 2007). Hence, education is essential (formally through the education system, official campaigns and programmes and informally through the media and social networks) to increase water awareness, spread knowledge about water, support and foster the motivation to take responsibility and change behaviour regarding water.

Unsurprisingly, my own awareness and knowledge about water underwent considerable change as a result of writing this thesis. A few years ago one of my supervisors recommended that I 'live' water in order to make sense of what was then

only a fledgling idea of *Water Centrality*, but my understanding of that was unclear. However, now that this thesis has been written and I am comfortable with its ideas, I see the value of this recommendation. Living in a culture that values water mainly as a resource makes it challenging to think, feel and live water differently, although it helps to get in touch with the feminine side.

It is remarkable how much more aware I am now about water use in house and garden, regarding both the amount and purpose. I ask more questions and make in-depth enquiries about how much water is being 'used' for the products I buy and use, and I often ponder all the intricate connections that water has in and with my surroundings and myself, and how it enables and facilitates everyday processes and items that are an integral part of life. I marvel at this wonder that is water and often talk about it.

Starting to live *Water Centrality* means for me, among many other things, that I try to reduce my energy consumption and car use because GHG emissions contribute to global warming thereby affecting the water system; that I try to buy organic food wherever possible because organic agriculture protects the groundwater system from chemical pollution, keeps the soil healthy and the reduced chemical load is also better for the water cycle in my body; it means being more conscious about my personal hydration status because a minimal level of dehydration can have deleterious effects on brain and other organ function, and therefore wellbeing; etc. etc. etc. The list can be endless.

This endless list has the danger of appearing overwhelming, but it is a matter of starting somewhere and adding to it bit by bit until the new way of life becomes second nature. For example, a guide or guides, such as a water cycle inventory (probably best in the form of a website or other interactive medium) or publications such as the Water*mark* and *Water Innovation* that have practical relevance for everyday life, could be helpful. For those individuals who are more intuitively or mystically inclined such authors as Marrin, Schwenk or Emoto may be more accessible. It may be a matter of first sparking interest by identifying those water facets most relevant for a particular individual. Then the elements are identified that are easiest to implement, making them a habit, before gradually introducing other behavioural changes. It is conceivable that there are certain basic elements that, once considered, will also take care of other, more complex, issues.

As is not unusual for a member of my species, I rarely think of the full implications of my actions, I often make decisions rashly rather than thinking them through and regularly seek instant gratification rather than considering long-term effects or the potential impacts on the next generation. Although these human traits may slow the implementation of *Water Centrality*, they are not necessarily an issue provided the major decisions are water central and water is considered in all other decisions as much and as often as possible. If such initiatives as the water currency and the WCC were implemented this could help put water at the forefront of our minds, and eventually make a difference to how we see the world and how we live with and within it.

Ideally, *Water Centrality* is an idea that the world has been waiting for that has so much appeal that readers of the thesis and subsequent publications become 'converts' and spread the message. Maybe water is the substance that can help us realise that we know that we need to change the way we live; until now, we have overlooked, or not fully realised, that water provides a suitable avenue to do so. *Water Centrality* may be a way of accomplishing this since it is about changing our relationship with water and, by extension, to everything else throughout society in a coherent, practical and intuitive way.

This brings me, once more, to the beginning of my quest of attempting to identify social water requirements. Readers of this thesis, particularly the water managers of Western Australia, may still have to grapple with the issue, at least until the full implementation of *Water Centrality* makes the identification of different values of water unnecessary or a matter of course. I realise that there is little practical guidance for managers in this thesis beside the recognition that the separation of economic, environmental and social values is not conducive to holistic water management, and that all these values should be considered together in a more inclusive approach.

Speaking from a *Water Centrality* perspective, my advice to practitioners would be to take a broad picture approach and, essentially, let water and people be your guide. Talking to people, listening to their stories and taking their emotions seriously can go a long way towards finding out what they value. Taking a good look at the water system that is being assessed, not only the river, stream or lake, but also all that surrounds it, the plants and animals, the landforms, the land use, the people and their settlements and structures, the groundwater, the climate and weather, can help make previously hidden connections obvious. Learning as much as much as possible about the human-

environment system and the connections and, dare I say, letting it 'speak' to you from a water point of view may provide valuable insights. If people can see humans as part of the intricate web that depends on water, recognising that we can only survive and thrive if our environment with its water system is functioning well, it may be clear that other expectations, such as economic ones, will have to be adjusted.

Since these recommendations are not based on empirical evidence, or entirely personal experience, they can be seen as an educated guess based on the literature and the suggestions made in this thesis. It could be said that in a way I have come full circle – for the future there is still the question of "how to".

My hope is that this concept is sufficiently inspiring for others to take on and support. Humanity and planet 'water' need it…

> What is the meaning of water? One might as well ask "What does it mean to be human"? The answer may be found in our relation to water, the mother of life. When the waters again run clear and their life is restored we might see ourselves reflected whole. (Orr, 2004 p.59)

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Water Centrality
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- Appendices -

Ute Goeft
Bachelor of Science (Environmental Management) Honours

This thesis is presented in fulfilment of the requirements for the degree of
Doctor of Philosophy

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Water Centrality Instrument (WCI) – blank form

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
1		**Strategic Vision**			
1.1	a.	Is there a clear, broad and long-term vision?	*The vision is a statement of the overall aim. A succinct formulation should capture in easy to understand and broad terms what is to be achieved in the long run. It should inspire by being sensible and credible, sound and well-reasoned as well as emotionally appealing and vividly presented.*		
	b.	Does this vision reflect the centrality of water for life?	*The central role of water is taken into account and acknowledged in the vision. The centrality of water refers to its absolute importance for life and overall system function.*		
	c.	Is the vision defined by goals or objectives that also reflect the centrality of water for life?	*The goals define the vision in a more tangible and detailed way and show the importance and centrality of water, i.e. the connection water has with all aspects of life.*		
1.2	a.	Are ethical principles made explicit that may be represented by traditional water rights, human rights and indigenous lore of relevant societies?	*Ethical principles such as those represented by human rights, including the right to water, should be ensured. Traditional water rights may be taken into consideration if they represent ethical principles. Traditions and lore may need to be reviewed for their ethicality, e.g. inequitable distribution of water may not be acceptable even if it is a traditional right. This would best be embedded in a* Water Centrality Charter.		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
1.3	a.	Is broad consensus aimed for with regard to the best interest of the group and, where possible, policies and procedures to benefit the water system?	*Broad consensus[1] is more than a majority rule or decision; it means to achieve broad agreement, a common base through negotiation and conflict management to ensure acceptance of outcomes and enable implementation. This requires participation of all relevant stakeholders and decision makers (see also 2.1) and aims for the 'wellbeing' of the water system.*		
2		**Participation and Voice**			
2.1	a.	Are affected and interested parties, including non-human interests and water, represented and do they have a voice throughout processes of policy and decision making?	*It is not sufficient to state that all relevant stakeholders are included. Explicit listing of stakeholders (including women, youth, indigenous people and non-human life forms) would be useful in most cases. Representation of non-human life forms as well as water should be ensured through advocacy.*		
	b.	Is recognition of diverse and changing values ensured through this?	*Consideration of all values should be ensured through appropriate processes (see also 2.1.1.b). Changes over time need to be dealt with on an ongoing basis (see also 5).*		
2.1.1	a.	Are freedom of association and speech assured?	*These are basic human rights without which full participation cannot occur. The UDHR[2] affirms the right to free speech so does the ICCPR[3]. Australia is*		

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[1] The WCI is an organising tool that by itself cannot achieve consensus; conflict management, not conflict resolution, should be used to harness the creative potential of conflict and tension Dietz, T., E. Ostrom, et al. (2003). The struggle to govern the commons. *Science* **302**(5652): 1907-1912. and reach a common accord or basis from which to proceed that does not imply uniform opinions or total agreement

[2] Universal Declaration of Human Rights (UDHR), Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

[3] Article 19(2) of the United Nations International Covenant on Civil and Political Rights (ICCPR) (1966) states that: Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice. The ICCPR forms Schedule 2 of the Human Rights and Equal Opportunity Commission Act 1986 (Commonwealth).

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			a signatory to both but has not enshrined free speech into legislation and hence it is not enforceable in court, while freedom of association was mainly granted with regard to unions in Australia. The situation may require attention since these rights are not automatically ensured and should be officially enshrined in some form as well as being enforced. Arguably, a form of participative democracy would best suit Water Centrality *to enable fuller participation overall.*		
	b.	Are capacities to participate constructively ensured?	*Constructive participation is based on accessibility, openness and fairness (see also 5 and 6) but also should ensure that participatory processes are tailored to the participants so they are not disadvantaged because of gender, ethnicity, age, economic or literacy status or other potential impediments (see also 7).*		
2.1.2	a.	Is the participation of decision makers ensured to secure a firm link to adopted policies and resulting action that benefit water?	*Decision makers are stakeholders who need to be included from the start, preferably in the planning stages, so that coherency and implementation are ensured to the benefit of water.*		
3		**Equity and Fairness**			
3.1	a.	Are the ecological conditions and the central role of water on which life depends considered for equity amongst all life forms?	*Changes in ecological conditions can have far-reaching consequences and need to be identified so they can be addressed. In this, all life forms, including humans, need to be treated equitably due to interdependence.*		
	b.	Is the central role of water for those ecological conditions considered?	*Without water there is no life, so water availability is central to all ecosystems and life forms as well as their functions. This should be acknowledged clearly.*		
3.1.1	a.	Do all groups in society as well	*Adequate access to water is the basis for existence*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		as non-human life forms have adequate access to water to ensure opportunities to improve their wellbeing?	*and wellbeing for all life forms, human and non-human. Hence, existing ecosystems and human populations need to have at minimum sufficient water for survival. Humans are part of the ecosystem and rely on healthy ecosystem function hence this function needs to be ensured while human needs also have to be covered beyond mere survival (see Chapter 2). Decisions should be based on information and knowledge and human influences have to be balanced accordingly.*		
3.1.2	a.	Are intra- and inter-generational equity and disparity considered in terms of resource use and access, water quality, pollution, poverty, over-consumption, human rights and access to services?	*Equity is essential for Water Centrality. All people should have equal rights and obligations as well as equal opportunity to the listed issues, as a minimum[4]. The needs of future generations must be considered as well as the needs of the people currently alive. Considerations need to include equity between regions, e.g. in inter-basin water transfers.*		
	b.	Are these considerations in 3.1.2.a related to water?	*Water is essential to or interacts with most of these considerations (see 3.1.2.a) and hence these relationships need to be explored appropriately.*		
4		**Integration and Coherency**			
4.1	a.	Is there a review of the whole system as well as its parts?	*A review of an entire system may be difficult and complex, depending on the system in question, but has to take place at some stage (rather sooner than later). Systems can be encapsulated within other systems and different scales may need to be considered depending on the situation.* *It would be useful to do a review of the whole water system and all water cycles showing*		

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[4] Rawls (1971) argued that if there is to be liberty of opportunity, then opportunity must exist for all in every institution. If water doctrines do not promote equality of liberty of opportunity in access to water, then the liberties of the whole society are reduced. Tisdell, J. G. (2003). Equity and social justice in water doctrines. *Social Justice Research* **16**(4): 401-416.

		Water Centrality Questions	*Expectations*	*Assessment* (*how is it done?*)	*Shortfalls* → *Improvements*
			interconnections as well as direct and indirect effects, so that this can be referred to in reviews of lower scale systems and used to place these systems into context (in a nested approach) since a subsystem cannot stand alone. A conceptual model of the system in question showing all the connections to water should be produced. Such a review requires a participatory approach, such as mapping exercises and others. Methodologies such as input-output analysis of water use (Lenzen and Foran 2001) may be useful. The values of water (Chapter 2) may be a starting point and rough guide.		
	b.	Is the central role of water being made explicit in the system and its parts?	*This is paramount since water is the source of life. It includes direct as well as indirect roles of water. The whole water system review should serve to make the central role of water explicit, with quantitative as well as qualitative aspects (values of water, input-output analysis (e.g. Lenzen and Foran 2001)).*		
	c.	Are the implications and potential impacts for all water cycles considered?	*These include the local, regional and global water cycles as well as those above ground and underground in liquid, vapour and solid (ice) form, taking into consideration living and non-living elements. The virtual water cycle may also need to be considered.*		
	d.	Are the connections and interdependencies of water considered?	*Since water is central to life its connections and interdependencies need to be explored fully.* *The review of the water system should show this. A form of input-output analysis may be useful.*		
	e.	Is sufficient knowledge available about the system and its parts? If not, are provisions made to address this?	*This has to be determined on a case by case basis. If insufficient knowledge is available efforts should be made to remedy this (see also 6.3, 6.7, 7.3 and 7.4).* *In the meantime the precautionary principle should*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			be adopted. *Review and update regularly.*		
4.1.1	a.	Is the wellbeing, its state as well as the direction and rate of change, of the ecological subsystem and its component parts considered with regard to water?	*The ecological subsystem* comprises all living things and the cycles they rely on as well as the role water plays in these. Although humans are part of this subsystem they are considered separately in the social subsystem (4.1.1.b) due to the extensive influence we have on the water system.* **It seems useful to explore the subsystems separately and in detail to facilitate better understanding, but it is important to take note of any interconnections with other subsystems so they can be taken into account (in 4.1.1.d). Trends need to be identified in order to anticipate change and prioritise actions. It may be useful to have a generic conceptual model of the system in question to guide exploration (the review of 4.1 could be a useful guide).*		
	b.	Is the wellbeing, its state as well as the direction and rate of change, of the social subsystem and its component parts considered with regard to water?	*The social subsystem refers to human endeavours, activities and institutions and the cycles they rely on as well as those that depend on human interaction (see also Chapter 2).* *Those concerns directly to do with physical survival are not strictly social but are included for the sake of simplicity. (See also* at 4.1.1)*		
	c.	Is the wellbeing, its state as well as the direction and rate of change, of the economic subsystem and its component parts considered with regard to water?	*The economic subsystem is arguably a subsystem of the social (or human) system but since economics appears to be of great importance to humans it is dealt with separately. This subsystem relates to the production, distribution and trade of goods and wealth and needs to be related to water. (See * at 4.1.1)*		
	d.	Are the wellbeing, the state as	*All three subsystems interact and therefore it is an*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		well as the direction and rate of change, of the interactions of the subsystems and their component parts being considered with regard to water?	*important if complex (and often neglected) task to fully explore the interactions of all subsystems to detect trends, opportunities and threats that arise from these interactions.*		
4.1.2	a.	Are the positive and negative outcomes of human activities identified as monetary and non-monetary values of water (= ecosystem services of water), so that the costs and benefits to human and ecological systems are reflected?	*In all three subsystems both monetary and non-monetary values exist (are assigned by humans). All of them are important for a fuller picture of the outcomes of human activities, positive and negative, for both humans and ecological systems (since without functioning ecosystems human endeavours are impossible).*		
4.1.3	a.	Are the ecosystem services of water fully considered?	*This needs to be done with regard to direct and indirect ecosystem services such as regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment 2005). All these services depend on water or are connected to it (see also Chapter 3.2).*		
	b.	Are the economic activities that contribute to human/social wellbeing considered with regard to water?	*This is a more detailed look at the monetary values, as well as trade and commerce activities related to water in terms of their contribution to human wellbeing (could be part of 4.2.1.c and 4.2.3.b).*		
	c.	Are the non-market activities that contribute to human/ social wellbeing considered with regard to water?	*A more detailed look at non-monetary values that contribute to human wellbeing and their relationship with water (could be part of 4.2.1.b, 4.2.2.a and 4.2.3.b).*		
	d.	Are the interactions of the ecosystem services of water as	*The interactions of the ecosystem services outlined in 4.2.3.a-c can oppose or negate each other and*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		well as their economic and non-market values considered?	*should be fully explored to anticipate or prevent serious implications for human and ecosystem wellbeing.*		
	e.	Are all these elements considered in a local, regional, national and global context?	*All these elements (4.2.3.a to 4.2.3.d) need to be considered with regard to these levels to ascertain their influences and extent and how they are best approached or solved. These contexts may overlap or be discrete but it is likely that more than one level will apply and cross-scale influences will need to be considered (see e.g. Dietz, Ostrom et al. 2003).*		
4.1.4	a.	Are the time frames long enough to capture all water system (hydrological cycle) time scales?	*This depends on the water system(s) that are affected and varies with the nature of the assessed item and the spatial scale. However, all water systems and cycles are interdependent, which needs to be realised and acknowledged.* *Since it is not practical to do a full assessment of all water cycles in all systems in all cases, a full inventory of water cycles and their interactions should be available elsewhere for reference.*		
	b.	Are time scales appropriate to cater for future generations?	*This implies multiples of a human generation length (~25yrs).*		
	c.	Are time scales appropriate for current short-term decision making?	*Should be suitable for the case in question and may include election or review cycles.*		
4.1.5	a.	Is the spatial frame of reference sufficiently large to include both local and long distance impacts on water systems?	*Long distance and cross-scale influences (atmospheric, groundwater, rivers) can have great importance on local conditions and* vice versa*. Even if the assessment is for a small area the broader picture needs to be captured so that these influences can be ascertained (see also 4.2.3e).*		
4.1.6	a.	Are historic considerations included in anticipating future	*Includes traditional, cultural, ecological, spiritual, legal, commercial, political and administrative*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
		conditions of water?	*heritage and their relationships to water. Their influence may be past or ongoing but all need to be considered for potential effect of the future of water systems.*		
	b.	Are current conditions of water systems considered in anticipating future conditions?	*The current state of the water system, in terms of water availability, quality, hydrogeology, ecology as well as allocation status, can determine future outcomes and needs to be documented and assessed, also as a reference point.*		
	c.	Where could we go? Are all possibilities and alternatives considered?	*All scenarios and possibilities, including the 'no change' option and utopian ones, can be informative and inspiring and need to be explored to ensure that fully informed decisions are made.*		
4.1.7	a.	Is an explicit set of categories or an organising framework employed that links vision and goals to indicators and assessment criteria?	*A clear framework can help with identifying meaningful indicators and aid assessment (e.g. Peet and Bossel 2000); this needs to be linked to the vision and goals to ensure that intended outcomes are achieved. Review framework and indicators regularly for appropriateness.*		
	b.	Do the set of categories or the organising framework have water as a central concern and are the indicators and assessment criteria related to the water system?	*The framework has to ensure that water is made a central concern and the indicators or the assessment criteria need to be chosen accordingly. While this would include obviously water-related elements, given that water is relevant for most aspects of interest to humans, at least indirectly, many 'non-water' aspects could also be valid.*		
4.1.7.1	a.	Are a limited number of key issues used for analysis?	*A limited number of key issues help reduce complexity. Ensure that key issues are correct and applicable through an inclusive participatory process.*		
	b.	Are these key issues related to water and *Water Centrality*?	*While most issues are related to water, at least indirectly, those that have the most obvious and*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			relevant connections to the Water Centrality Principles should be chosen.		
4.1.7.2	a.	Are a limited number of indicators or indicator combinations used that provide a clear sign of progress towards *Water Centrality*?	*Fewer indicators limit complexity, but they need to be relevant to what is assessed, in this case progress towards* Water Centrality. *A policy may not need to be descriptive in detail but should ensure guidance if subsequent processes or documents need to deal with this.*		
4.1.7.3	a.	Are measurements standardised wherever possible to allow comparison?	*Standardisation is usually not a problem for quantifiable measurements but can be more difficult for some qualitative data. Comparison is important for monitoring progress and trends.*		
	b.	Do these measurements relate to water?	*Although most measurements can be related to water, at least indirectly, the most appropriate and relevant should be chosen.*		
4.1.7.4	a.	Are indicator values compared to targets, reference values, ranges, thresholds or directions of trends, as appropriate?	*Comparison is paramount to assess progress and trends.* *Indicators can be quantitative or qualitative and include not only bio-physical and socio-economic but also political measures, e.g. policy and legislation. Performance targets should be complemented by information targets[5] to allow for ongoing evaluation and course corrections.*		
	b.	Do these values relate to the water system?	*Indicator values as well as target values should be related to the water system as explicitly as possible.*		
4.1.8	a.	Is information drawn from indicators and other tools that are stimulating and serve to engage decision-makers?	*Meaningful and relevant information is best, but may not be readily available and an ongoing search for information and knowledge is needed (see 5.2.1). Decision makers need to be interested to ensure*		

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[5] Information targets are indicator points that are set throughout a project to gauge progress that can include quantitative as well as qualitative information concerning targets but also players, processes and structures Westley, F., B. Zimmerman, et al. (2006). Getting to maybe: how the world is changed. Canada, Random House..

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			ongoing involvement, commitment and appropriate decisions.		
	b.	Is this information related to water?	*All information derived from indicators and other tools should be related to water to show their connections, especially when these are indirect.*		
4.2	a.	Are the increasing complexity of water issues, appropriate policies and actions taken into account so that they become coherent, consistent and easily understood?	*Increasing complexity of water issues, in terms of institutions, increased competition due to population growth, markets, etc., needs to be identified and documented or otherwise made explicit. Existing policies and actions need to be outlined and their relationship to each other as well as to the assessed items explained clearly. An understandable picture of the overall situation should be created that shows how all parts work together, identifying inconsistencies so they can be addressed. Findings from 4.1 form the basis for this.*		
5		**Ongoing Responsiveness and Efficiency**			
5.1	a.	Do institutions and processes serve all stakeholders, including water?	*It is important that institutions and processes do not exclude any stakeholders either by design or inadvertence; they need to be inclusive (see also 2.1)ensuring that water is considered as a 'stakeholder' with reluctant parties also being identified and included as far as possible.*		
	b.	Are institutions and processes responsive to change and uncertainty with particular attention to water?	*Ongoing monitoring and review needs to be ensured (through expertise, finances, administration, processes, etc.) and new insights and knowledge need to be incorporated on an ongoing basis to effectively deal with change and uncertainty (e.g. Pahl-Wostl, Sendzimir et al. 2007) (see also 5.1.1 and 5.1.2). This needs to occur with particular attention to water in its direct and indirect guises, ensuring that no important issue is overlooked or*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			under attended.		
5.1.1	a.	Does the capacity exist to determine trends through measurements that are iterative, adaptive and repetitive?	*The capacity to undertake regular review and analysis of trends as well as making the necessary adaptations needs to be provided. This requires adequate human, financial and procedural resources.*		
	b.	Do the measurements show the effects on the water system?	*Measurements should be made with their relevance to the water system in mind; highly relevant ones should be preferred if possible and appropriate, depending on the context; if the measures relate indirectly to water only this may be more difficult.*		
5.1.2	a.	Is there commitment to ongoing review of performance?	*Performance review is a standard process in a responsible institution or organisation. It makes review meaningful, especially if findings are translated into useful adaptation and change; this should occur with particular emphasis on water and Water Centrality.*		
	b.	Are goals, frameworks, processes and indicators adjustable in light of new insights and emergence of traditional knowledge with emphasis on water?	*New knowledge, particularly that related to water, needs to be distributed and incorporated where applicable so that changes can be made as appropriate. This has to be ongoing and enshriate in review processes.*		
5.1.3	a.	Is feedback on decision making encouraged with particular attention to water?	*Feedback ensures that problems with decisions are detected before they escalate. Changes can be made if appropriate and ultimately acceptability of decisions and outcomes to stakeholders can be increased. Particular attention should be on water.*		
5.2	a.	Is collective learning and its development promoted?	*Collective learning is not only based on review but entails active seeking of new ways of doing and new and hidden or obscured knowledge (e.g. Pahl-Wostl, Sendzimir et al. 2007).*		

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	b.	Is collective learning emphasising and relating to water?	*Any learning should be related to and emphasise the connections to water to promote awareness of* Water Centrality *and water relationships (see e.g. Centre for Ecoliteracy 2000).*		
5.2.1	a.	Is there commitment to ongoing search for new, traditional and indigenous knowledge?	*The discovery of knowledge needs to be supported on an ongoing basis to ensure long-term increase of knowledge which allows for the best possible decisions to be made.*		
	b.	Is the ongoing search for knowledge emphasising water?	*Water-related knowledge and the knowledge of water relationships are particularly pertinent to* Water Centrality *and should be fostered specifically.*		
5.3	a.	Are decisions made with the aim of achieving economic efficiency, ecological effectiveness and a functional water system?	*It is important to meet the needs of stakeholders and users while making the best use of available resources (which are usually limited) and doing the least possible harm to the environment and the water system in the process.*		
6		**Institutional and Community[6] Capacity**			
6.1	a.	Is ongoing support in the decision making process provided?	*Guidance for decision making should be provided to organisations and individuals as appropriate to ensure that well informed, practical and reasonable decisions are made that suit the situation. Support also includes appropriate human and other resources and capacity.*		
	b.	Is ongoing decision support highlighting water?	*Any decision support should ensure that water is considered, directly or indirectly, as appropriate.*		
6.2	a.	Is institutional capacity for data collection, maintenance and documentation as well as for	*Basic prerequisites such as facilities, training, human and financial resources as well as processes need to be available on an ongoing basis (see also*		

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[6] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others Adams, D. and M. Hess (2001) Community in public policy: fad or foundation? *Australian Journal of Public Administration* **60**, 13-23 DOI: 10.1111/1467-8500.00205.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		auditing these provided?	*6.3).*		
	b.	Is institutional capacity for data collection, maintenance, documentation and auditing appropriate for water?	*Facilities, training, human and financial resources as well as processes need to be designed so that water issues are considered throughout and as appropriate for direct and indirect water issues.*		
6.3	a.	Is there commitment to ongoing institutional capacity building and modernisation or renewal?	*Mechanisms need to be in place that ensure ongoing review and renewal in the face of new information and knowledge but institutions also need to actively seek learning and progress to ensure that the needs of stakeholders and users are met on an ongoing basis. The principles of social learning may be usefully employed (e.g. Pahl-Wostl, Sendzimir et al. 2007).*		
	b.	Is institutional capacity building and modernisation or renewal done with keeping water in mind?	*All capacity building and renewal or updates should occur in a manner that emphasises water and its central role as well as all its relationships, hence the mechanisms mentioned under 6.3.1 should cater for water and ensure that it is considered.*		
6.4	a.	Is community capacity building enabled, supported and facilitated?	*Community capacity relates to informal or organised interactions of people and resources existing within a community that aid in problem solving, provide the basis to adapt to change and maintain wellbeing (Goodman, Speers et al. 1998; Chaskin 2006). It is also called community development and refers to local empowerment and the ability of communities to help themselves, which depends on strong social cohesion and low incidence of social problems as well as development of self esteem, confidence, self-reliance and decision-making power (Department for Community Development 2005). Local initiatives need institutional and government support as well as resources, which include appropriate structures and processes (see also sections 2, 5, and 7) as well as*		
6.4.1	a.	*Community development* Is capacity for participation and leadership developed and fostered?			
	b.	Is skills development supported?			
	c.	Are resources provided (financial, social and technical) and is their prudent use ensured?			
	d.	Are social and inter-			

		Water Centrality Questions	*Expectations*	*Assessment (**how is it done?**)*	*Shortfalls* → *Improvements*
		organisational networks fostered?	*those elements under 6.1-3 and 6.5. Social learning may also be useful in this context (e.g. Pahl-Wostl, Sendzimir et al. 2007).*		
	e.	Is the development of self-esteem, confidence, self-reliance and decision-making power supported?	*Water should be a central consideration in all these activities, highlighting the role of water in these and fostering (the awareness of) relationships with water.*		
	f.	Is a sense of community promoted?			
	g.	Are all these efforts undertaken with water in mind or a focus on water?			
6.5	a.	Are institutions able to deal with all forms of water?	*Institutions are often set up to deal with blue (liquid) water or waste water or sewage but have limited capacity to deal with green water, grey water (household waste water except toilet waste), black water (toilet waste), water vapour or virtual water (indirect water transfer through produce trade). This is true for formal[7] as well as informal institutions. The complexities of interconnectivities between these forms of water also need to be addressed as appropriate.*		
7		**Transparency, Accessibility and Accountability**			
7.1	a.	Is information distributed freely within society?	*Information needs to be easily accessible and distributed actively throughout society, including to disadvantaged and less interested members. There need to be provisions and mechanisms for this to occur, e.g. good media exposure, distribution of written and other information, internet presence.*		
	b.	Is this information accenting	*The tenet of* Water Centrality *should be supported by*		

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[7] Formal institutions are those set up in a formalised way, such as government departments, educational institutions or banks. Informal institutions are those that are not formally organised such as culturally based interest groups, although some of these, such as religious organisations, may also be formalised.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		water?	*emphasising water and its relationships wherever possible to increase water literacy; it should become a matter of course.*		
7.1.1	a.	Are processes, institutions, methods data and information available and accessible to all?	*Institutions need to be contactable and accessible, in person and via phone and electronic means as well as with regard to structure and processes. The latter should be transparent, appropriate and uncomplicated. Data, information and methods need to be freely available to all interested parties. They need to be understandable and in a format that is accessible to all stakeholders and useful for decision makers (e.g. Dietz, Ostrom et al. 2003). It also means that information needs to be available in different forms (e.g. print, radio, TV, and internet) since not everyone can read or has a TV, buys a newspaper or has internet access.*		
7.1.2	a.	Are all processes and decisions transparent and open to public scrutiny?	*It needs to be obvious and apparent which processes are applied, how they work and how they are used. It also needs to be clear how decisions are made and what the outcomes are. There need to be provisions for review and feedback (see also 5.1.3).*		
	b.	Do all processes and decisions take water into account?	*Water needs to be considered in all processes and in each decision; this may be in the form of an extra clause or set of questions or, ideally, should be built in or even focus on water.*		
7.1.3	a.	Are all judgements, assumptions and uncertainties in data and interpretations being made explicit highlighting what this means for water?	*All judgements, assumptions and uncertainties need to be revealed to reduce surprises, hidden agendas and the potential for corruption. This needs to be considered with regard to 4.1- whole system review and should highlight the potential and actual effects on the water system.*		
7.2	a.	Are documents, processes and	*Documents produced by and processes used in all*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		institutions designed to address the needs of the audience and users?	*institutions need to be understandable and user friendly. They also need to be relevant and appropriate to the audience, the process or institution in question. The institutions themselves need to be accessible and relevant, avoiding duplication or unnecessary complexity.*		
	b.	Are documents, processes and institutions designed to address the needs of water?	*Documents and processes should be well thought-out, relating to and emphasising the roles and values of water. The institutions themselves should be designed with water in mind; conceptually, water could be used as a role model to set up processes and other elements, e.g. information flows and data pools; physically, buildings and settings should cater for water through appropriate setting, architecture, building methods and materials, interior design, infrastructure, etc.*		
7.2.1	a.	Is the structure simple and is clear and plain language used that features water?	*The structure of documents and processes should be uncomplicated and unambiguous to enable ease of reading and use, for understanding without hidden meanings – flow and clarity. The language used must be plain and clear, using water metaphors where appropriate, with as little jargon as possible, for everyone to understand. Using water metaphors where appropriate enhances water awareness.*		
7.3	a.	Are government, private sector and civil society organisations accountable to the public and the interests they represent including the water system?	*Some form of public review or accountability process should be in place (e.g. such bodies as the Auditor General, the Ombudsman or the Senate Estimates Committee could be utilised/adapted) to ensure that organisations actually deliver what they are supposed to and that the possibility for corruption is minimised. Such system should have a focus on water in all its forms, ensuring that the water system is represented and considered always.*		

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
7.4	a.	Are responsibilities assigned clearly with accent on water?	*Responsibilities need to be allocated to the organisation(s), person(s) or institution(s) that can best deal with particular elements of the water system so that good outcomes are ensured. All roles need to be well defined and supported (see 6.3) and need to include conflict management and resolution mechanisms (see e.g. Dietz, Ostrom et al. 2003).*		

Appendix B:

Full *Water Centrality* Instrument Application to the

Intergovernmental Agreement on a National Water Initiative (COAG 2004)

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
1		**Strategic Vision**			
1.1	a.	Is there a clear, broad and long-term vision?	*The vision is a statement of the overall aim. A succinct formulation should capture in easy to understand and broad terms what is to be achieved in the long run. It should inspire by being sensible and credible, sound and well-reasoned as well as emotionally appealing and vividly presented.*	There are 'objectives' (23) with the overall aim of a nationally-compatible, market, regulatory and planning based management system for rural and urban surface and groundwater resources with optimised economic, social and environmental outcomes specified through 10 subclauses. Eight key elements are identified that reflect the subclauses (24), four of which refer to water entitlements, markets, pricing and accounting.	*Since the NWI is a national high level policy an actual vision may be desirable that has appeal and is inspiring to all people of Australia. The objectives (s.23) are clear but not inspiring, since they lack emotive appeal and colour, and there is no clear reference to the long-term.* *A vision should also have a broader context i.e. refer to the whole water system and have less emphasis on markets and the economy. The key elements (s.24) refer to integration without including economic aspects.*
	b.	Does this vision reflect the centrality of water for life?	*The central role of water is taken into account and acknowledged in the vision. The centrality of water refers to its absolute importance for life and overall system*	The objectives acknowledge that economic, social and environmental outcomes need to be optimised, but they do not reflect the centrality of water nor do they make reference to 'water for life'.	*A federal level water policy vision should reflect Water Centrality and relate to the whole water system, which this one does not do. It should include all life forms and their wellbeing, acknowledging the*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			function.		*central role of water in this.*
	c.	Is the vision defined by goals or objectives that also reflect the centrality of water for life?	*The goals define the vision in a more tangible and detailed way and show the importance and centrality of water, i.e. the connection water has with all aspects of life.*	The goals, or subclauses of the objectives, deal with blue water only and environmental management practices, administration, ownership issues, planning, trading, accounting, risk assignment, policy and adjustment issues (thereby taking care of much of the economic and some of the broader social and institutional issues) but do not mention health, the whole water system, integrated management or water for life.	*The objectives and the goals of the NWI should refer to the whole water system (i.e. blue AND green water, water vapour and virtual water, also waste water – black & grey) and need to be broadened to reflect the importance of water for all life and ecosystem services on which we depend.*
1.2	a.	Are ethical principles made explicit that may be represented by traditional water rights, human rights and indigenous lore of relevant societies?	*Ethical principles such as those represented by human rights, including the right to water, should be ensured. Traditional water rights may be taken into consideration if they represent ethical principles. Traditions and lore may need to be reviewed for their ethicality, e.g. inequitable distribution of water may not be acceptable even if it is a traditional right. This would best be embedded in a* Water Centrality *Charter.*	No obvious reference to ethical principles is made, but since Australia is a signatory to the Convention on Human Rights there is presumably an ethical base to water management in that respect, although the Convention has not been enshrined in legislation in Australia. Indigenous cultural water rights are recognised and access to water provided for social, cultural and customary purposes (52).	*There is no reference to ethical principles in the NWI. This should be remedied, but could be done by referring to a future* Water Centrality *Charter that would have to be a document based on ethical principles (see Chapter 8).*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
1.3	b.	Is broad consensus aimed for with regard to the best interest of the group and, where possible, policies and procedures to benefit the water system?	*Broad consensus[8] is more than a majority rule or decision; it means to achieve broad agreement, a common base through negotiation and conflict management to ensure acceptance of outcomes and enable implementation. This requires participation of all relevant stakeholders and decision makers (see also 2.1) and aims for the 'wellbeing' of the water system.*	Yes, as is implied in the name the parties all have agreed to the conditions set out in the agreement. Agreement is generally required and set at the level of states and territories and the federal government. Agreement is also required in the Natural Resource Management Ministerial Council (NRMMC) (18i). The word consensus is not mentioned and neither agreement nor consensus is sought from the community in engagement activities, although this is not precluded either.	*Agreement is achieved at the state/territory and federal level but does not necessarily extend to the community, as appropriate for a representative democracy as exists in Australia at present. However, Water Centrality is a participatory democratic approach and there should be provisions made for seeking consensus or agreement on the NWI Agreement at a broader scale (include bottom-up approaches in addition to top-down).*
2		**Participation and Voice**			
2.1	a.	Are affected and interested parties, including non-human interests and water, represented and do they have a voice throughout processes of policy and decision making?	*It is not sufficient to state that all relevant stakeholders are included. Explicit listing of stakeholders (including women, youth, indigenous people and non-human life forms) would be useful in most cases. Representation of non-human life forms as well as water should be ensured through advocacy.*	Indigenous needs are acknowledged in water planning (25 ix). Indigenous access to water resources will be provided according to relevant legislation and by including indigenous representation in water planning wherever possible (52 i). Open and timely consultation with all stakeholders will occur with regard to returning overdrawn water systems to environmentally sustainable extraction levels, periodic review of water plans, and other significant decisions that relate to the security of water access entitlements or the sustainability of water use (95).	*There is reference to some specific stakeholder groups, such as indigenous groups and downstream users, but overall reference to stakeholders is very general. Specific, and traditionally disadvantaged or disregarded groups, such as women and youth, as well as non-human life forms should be explicitly mentioned so they do not get neglected or overlooked.*

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[8] The WCI is an organising tool that by itself cannot achieve consensus; conflict management, not conflict resolution, should be used to harness the creative potential of conflict and tension Dietz, T., E. Ostrom, et al. (2003). The struggle to govern the commons. *Science* **302**(5652): 1907-1912. and reach a common accord or basis from which to proceed that does not imply uniform opinions or total agreement

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls →Improvements*
				In the case of reduced water availability water users, communities and associated industry will be consulted on how to address these impacts including trade-offs, past benefits, scale and speed of change and the risk assignment framework (97 i). The NWC will provide advice on national water issues and, in particular to assist effective implementation of the NWI Agreement. In preparing this advice the NWC will consider the views of stakeholders (Schedule C). Regulatory approvals for water use have transparent and contestable processes in place to establish whether a proposed activity is to be approved (Schedule D 1 vii); and have avenues for appealing approval decisions (Schedule D 1 viii). Stakeholders including those within or downstream of the plan area are consulted in the planning process (Schedule E 5 iii). Consultation with stakeholders in water planning including those within or downstream for the plan area (Schedule E 6 i)	
	b.	Is recognition of diverse and changing values ensured through this?	*Consideration of all values should be ensured through appropriate processes (see also 2.1.1.b). Changes over time need to be dealt with on an ongoing basis (see also 5).*	This is not obvious from the Agreement and there is no reference made to this. Presumably, some changes in values would be captured in the normal plan review process where stakeholder input is thought.	*Ensuring that diverse and changing values are captured through ongoing participatory processes should be enshrined and be made prominent in the policy.*
2.1.1	a.	Are freedom of association and	*These are basic human rights without which full*	There is no reference made to this but it is generally provided in Australia, although not guaranteed in any	*The NWI does not make any reference to Human Rights,*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		speech assured?	*participation cannot occur. The UDHR[9] affirms the right to free speech so does the ICCPR[10]. Australia is a signatory to both but has not enshrined free speech into legislation and hence it is not enforceable in court, while freedom of association was mainly granted with regard to unions in Australia. The situation may require attention since these rights are not automatically ensured and should be officially enshrined in some form as well as being enforced.* *Arguably, a form of participative democracy would best suit* Water Centrality *to enable fuller participation overall.*	legislated form.	*including freedom of association and speech. It is unclear what the exact situation is in Australia since the Convention of Human Rights has not been translated into law in Australia. This may need to be addressed in a different forum.*
	b.	Are capacities to participate constructively	*Constructive participation is based on accessibility, openness and fairness (see*	The Agreement does not make any reference to this.	*Participant capacity is not considered in the Agreement but is an important aspect that should be*

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[9] Universal Declaration of Human Rights (UDHR), Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

[10] Article 19(2) of the United Nations International Covenant on Civil and Political Rights (ICCPR) (1966) states that: Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice. The ICCPR forms Schedule 2 of the Human Rights and Equal Opportunity Commission Act 1986 (Commonwealth).

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		ensured?	*also 5 and 6) but also should ensure that participatory processes are tailored to the participants so they are not disadvantaged because of gender, ethnicity, age, economic or literacy status or other potential impediments (see also 7).*		*included by providing open, accessible and fair processes that are tailored to participants' needs in order to make participation effective and equitable.*
2.1.2	a.	Is the participation of decision makers ensured to secure a firm link to adopted policies and resulting action that benefit water?	*Decision makers are stakeholders who need to be included from the start, preferably in the planning stages, so that coherency and implementation are ensured to the benefit of water.*	Decision makers are the initiators of the NWI and are part of the planning and allocation processes on an ongoing basis which generally should ensure that existing policies are considered. With regard to implementation it is expected that this occurs and is backed up through regular review processes.	*The NWI was initiated by decision makers and they are involved in administration, planning and allocation processes on an ongoing basis, hopefully ensuring a secure link between policy and action.*
3		**Equity and Fairness**			
3.1	a.	Are the ecological conditions and the central role of water on which life depends considered for equity amongst all life forms?	*Changes in ecological conditions can have far-reaching consequences and need to be identified so they can be addressed. In this, all life forms, including humans, need to be treated equitably due to interdependence.*	Not explicitly in that context, although "…, governments have a responsibility to ensure that water is allocated and used to achieve socially and economically beneficial outcomes in a manner that is environmentally sustainable." (2) There is also recognition that ecosystem function, biodiversity, water quality and river health are important. These are taken care of through environmental outcomes (Schedule Bi and Bii).	*There needs to be more explicit recognition of the ecological basis for life, and equity amongst life forms needs to be acknowledged more clearly.*
	b.	Is the central role of water for those ecological conditions considered?	*Without water there is no life, so water availability is central to all ecosystems and life forms as well as their functions. This should be acknowledged clearly.*	There is a direct connection to water since this policy is focussed on water and the Agreement is written is in context of WRM. There is commitment to environmentally sustainable levels of extraction to maintain key environmental assets or ecosystem functions and the productive base of the	*The limited recognition of water should be broadened to include green water and virtual water as well as the importance of water for all ecosystems and their services.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				resources (Schedule Bi). The recognition of the central role of water is limited to that of water in surface and groundwater sources and for ecosystems that are directly water dependent.	
3.1.1	a.	Do all groups in society as well as non-human life forms have adequate access to water to ensure opportunities to improve their wellbeing?	*Adequate access to water is the basis for existence and wellbeing for all life forms, human and non-human. Hence, existing ecosystems and human populations need to have at minimum sufficient water for survival. Humans are part of the ecosystem and rely on healthy ecosystem function hence this function needs to be ensured while human needs also have to be covered beyond mere survival (see Chapter 2). Decisions should be based on information and knowledge and human influences have to be balanced accordingly.*	Water markets and trading are intended to be accessible and efficient. Theoretically water markets and trading are intended to be accessible to everyone (who can pay) (58 ff & Schedule G). This includes minimisation of transaction costs (58 ii). Water pricing is intended to be best practice and based on consumption and full cost recovery (64-66). Some community service obligations will be fulfilled even though they may not be cost-effective (66 v c). Environmental function will be ensured by abstraction staying under or returning to sustainable limits.	*Access to water is mainly considered with regard to water markets and should be broadened to include other aspects such as health and wellbeing, both for humans and other life forms. This should include considerations of water quality, quantity and the full spectrum of human psychosocial water uses. The role and function of water utilities and water services could be made clearer.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
3.1.2	a.	Are intra- and inter-generational equity and disparity considered in terms of resource use and access, water quality, pollution, poverty, over-consumption, human rights and access to services?	Equity is essential for Water Centrality. All people should have equal rights and obligations as well as equal opportunity to the listed issues, as a minimum[11]. The needs of future generations must be considered as well as the needs of the people currently alive. Considerations need to include equity between regions, e.g. in inter-basin water transfers.	Governments have a responsibility to ensure that water is allocated and used to achieve socially and economically beneficial outcomes in a manner that is environmentally sustainable (2). Provide for adaptive management of surface and groundwater systems in order to meet productive, environmental and other public benefit outcomes (25 iv); implement firm pathways and open processes for returning previously over-allocated and/or overdrawn surface and groundwater systems to environmentally-sustainable levels of extraction (25 v). Access to consumptive water is taken into account in terms of water access entitlements which are secure and can be bequeathed (31 iii). Risk management is prescribed for consumptive water but without an explicit time frame. Water pricing and institutional arrangements are implemented to promote economically efficient and sustainable use of water (64 i). The Parties agree to ensure that proposals for investment in new or refurbished water infrastructure continue to be assessed as economically viable and ecologically sustainable prior to the investment occurring (noting paragraph 66 (v)) (69). Any release of unallocated water should be managed in the context of encouraging the sustainable and efficient use of scarce water resources (70). States and Territories agree to ensure open and timely consultation with all stakeholders in relation to (95):	Water resource use and over-consumption are considered but without direct reference to intra- and intergenerational equity, implied only in the relatively frequent reference to sustainability in the text; however, sustainability should be defined and/or reference be made to the National Strategy for ESD (1992) at the beginning of the document (see also 4.1.a). Pollution, poverty or human rights are also not explicitly addressed. This needs to be remedied.

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[11] Rawls (1971) argued that if there is to be liberty of opportunity, then opportunity must exist for all in every institution. If water doctrines do not promote equality of liberty of opportunity in access to water, then the liberties of the whole society are reduced. Tisdell, J. G. (2003). Equity and social justice in water doctrines. *Social Justice Research* **16**(4): 401-416.

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				pathways for returning overdrawn surface and groundwater systems to environmentally sustainable extraction levels (paragraphs 41 to 45 refer) (i). Compliance with any outstanding commitments under the 1994 COAG strategic framework for the efficient and sustainable reform of the Australian water industry (Schedule C). Trades must not generally result in sustainable yields being exceeded. That is, trades shall generally not cause an increase in commitments to take water from water sources or parts of water sources or increase seasonal reversals in flow regimes above sustainable levels identified in relevant water plans such that environmental water or water dependent ecosystems are adversely affected (Schedule G 5).	
	b.	Are these considerations in 3.1.2.a related to water?	*Water is essential to or interacts with most of these considerations (see 3.1.2.a) and hence these relationships need to be explored appropriately.*	Yes, since this is the NWI Agreement.	*It needs to be ensured that the relationships of the items in 3.1.2.a to water are considered when 3.1.2.a. is expanded.*
4		**Integration and Coherency**			
4.1	a.	Is there a review of the whole system as well as its parts?	*A review of an entire system may be difficult and complex, depending on the system in question, but has to take place at some stage (rather sooner than later). Systems can be encapsulated within other systems and different scales may need to be*	"Water may be viewed as part of Australia's natural capital, serving a number of important productive, environmental and social objectives. Australia's water resources are highly variable, reflecting the range of climatic conditions and terrain nationally. In addition, the level of development in Australia's water resources ranges from heavily regulated working rivers and groundwater resources, through to rivers and aquifers in almost pristine condition." (1) The 1994 COAG water reform framework and its	*The NWI addresses many parts of the water system but this is not done in a systematic way. It should make reference to all parts of the water system including rain water and water vapour as well as waste water and stormwater and the receiving environments such as oceans. Virtual water also needs to*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			considered depending on the situation. *It would be useful to do a review of the whole water system and all water cycles showing interconnections as well as direct and indirect effects, so that this can be referred to in reviews of lower scale systems and used to place these systems into context (in a nested approach) since a subsystem cannot stand alone. A conceptual model of the system in question showing all the connections to water should be produced. Such a review requires a participatory approach, such as mapping exercises and others. Methodologies such as input-output analysis of water use (Lenzen and Foran 2001) may be useful. The values of water (Chapter 2) may be a starting point and rough guide.*	amendments are acknowledged (3, 6) as are other relevant plans, institutions and strategies (7) over which the NWI takes precedence. The overall aim of the NWI agreement is to achieve national compatibility in WRM (23). Plans and frameworks are updated or developed in accordance with the NWI (26). States and Territories agree to adjust their existing legislation and administrative regimes with regard to waster access entitlement and planning frameworks as set out in the NWI (27). Implementation across Australia of compatible, publicly accessible and reliable water registers (59). Compatible institutional and regulatory arrangements for intra and interstate trade and management of differences in entitlement reliability, supply losses, supply source constraints, trading between systems and cap requirements (60). Completion of studies to facilitate trading (61) relating to work already under way (i), to facilitate cross system compatibility (ii) and to assess feasibility of markets for tradeable salinity and pollution credits (iii). Institutional arrangements ensure that the roles of water resource management, standard setting and regulatory enforcement and service provision remain separate (74). Benchmarking of jurisdictional water accounting systems on a national scale (81). Robust water accounting to protect the integrity of the access entitlement system (82) by setting accounting system standards (i), standardise reporting formats (ii), and develop water accounts that can be reconciled annually and aggregated to produce a national water balance (iii) that take into consideration all significant water use for all	*be considered as do all the relevant institutions other influences.* *The NWI would be a prime document to include, or at least to initiate and refer to, a review of the whole water system and its parts including their interconnections.* *Problems and areas lacking in knowledge could be identified and addressed at a strategic level helping to coordinate efforts and identifying knowledge gaps, research priorities and policy and funding requirements.* *A thorough review of the whole water system, its parts and interconnections would be helpful for many lower level policies and plans that could refer to it and build on it, and it is essential for a water society.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				managed water resource systems (a), integrates the accounting of water use in connected groundwater and surface water systems (b) and considers land use change, climate change and other externalities as elements of the water balance (c). This will include environmental water accounting (84).	
				Identification of systems with close interaction of groundwater aquifers and surface streamflow and establishment of an integrated accounting system (83).	
				Establishment of a compatible register with relevant details of new and existing environmental water (consistent with 35) (85 i).	
				Improved coordination of data collection and management systems to facilitate improved information sharing (86 i), partnerships in data collection and storage (86 ii), and best practice data management systems for broad application (86 iii).	
				In preparing water plans relevant regional natural resource management plans and cross jurisdictional plans need to be considered where applicable (Schedule E 5 i).	
				In water plans impacts on water users and the environment need to be considered that the plan may have downstream (including estuaries) or out of its area of coverage, within or across jurisdictions (Schedule E 5 iii).	
				Schedule D and Schedule E 1, 5 & 6.	
	b.	Is the central role of water being made explicit in the system and its parts?	*This is paramount since water is the source of life. It includes direct as well as indirect roles of water. The whole water system review should serve to make the central role of water explicit, with quantitative as well as*	(1) Water may be viewed as part of Australia's natural capital, serving a number of important productive, environmental and social objectives.	*There is no reference to the central role of water nor is this being made explicit anywhere in the document. In particular the preamble needs to be amended and should refer to UN or other documents that recognise the important role of water for life.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			qualitative aspects (values of water, input-output analysis (e.g. Lenzen and Foran 2001)).		Water Centrality *should be affirmed.*
	c.	Are the implications and potential impacts for all water cycles considered?	*These include the local, regional and global water cycles as well as those above ground and underground in liquid, vapour and solid (ice) form, taking into consideration living and non-living elements. The virtual water cycle may also need to be considered.*	No, since there is only limited mention of some water cycles and parts of water cycles as well as some interconnections between them and major aspects such as rain and vapour are not even mentioned, nor are climate, weather or soil moisture (see also 2.1.a).	*There needs to be a more thorough representation of all water cycles considering as many potential impacts and implications as possible. This needs to go hand in hand with a review of the whole water system (see 4.2.a).*
	d.	Are the connections and interdependencies of water considered?	*Since water is central to life its connections and interdependencies need to be explored fully. The review of the water system should show this. A form of input-output analysis may be useful.*	There is only limited mention of interdependencies such as the connection between surface and groundwater systems, overallocation and environmental damage or water access titles and efficient use of water. Others, such as the link between irrigation and salinity, consumptive and recreational use or reduction of rainfall due to clearing of vegetation and land use changes are not mentioned. The level of connectivity between surface (including overland flow) and groundwater systems needs to be assessed in water plans (Schedule E 5 ii).	*The connections and interdependencies of water need to be explored in more detail and more fully, including indirect ones, such as ecosystem services. This should be part of the review of the whole water system (see 4.2.a).*
	e.	Is sufficient knowledge available about the system and its parts? If not, are provisions made to address this?	*This has to be determined on a case by case basis. If insufficient knowledge is available efforts should be made to remedy this (see also 6.3, 6.7, 7.3 and 7.4). In the meantime the*	The NWI identifies a number of areas where there are significant knowledge and capacity building needs for its ongoing implementation. These include: regional water accounts and assessment of availability through time and across catchments; changes to water availability from climate and land use change; interaction between surface and groundwater components of the water cycle;	*The list of areas in need of knowledge is substantial but far from complete. Full knowledge of the water system is not possible but there is much untapped or dispersed knowledge that could be compiled here.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			precautionary principle should be adopted. *Review and update regularly.*	demonstrating ecological outcomes from environmental flow management; improvements in farm, irrigation system and catchment water use efficiency; catchment processes that impact on water quality; improvements in urban water use efficiency; and independent reviews of the knowledge base (98). There are significant national investments in knowledge and capacity building in water, including through the Cooperative Research programme, CSIRO Water Flagship and Land and Water Australia, State agencies, local government and higher education institutions. Scientific, technical and social aspects of water management are multi-disciplinary and extend beyond the capacity of any single research institution (99). Parties agree that the outcome of knowledge and capacity building will assist in underpinning implementation of this Agreement (100). All parties agreed that key knowledge and capacity building priorities are identified and more effectively coordinated (101). Schedule E: (3.) A plan duration should be consistent with the level of knowledge and development of the particular water source; and (4.) In the case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge.	*The agreement only aims to identify areas pertinent to its implementation which is not sufficient to cover the whole water system. There is no specific reference to local or traditional knowledge and the agreement needs to include that.*
4.1.1	a.	Is the wellbeing, its state as well as the direction and rate of change, of the ecological subsystem and its component parts considered with regard to water?	*The ecological subsystem* comprises all living things and the cycles they rely on as well as the role water plays in these. Although humans are part of this subsystem they are considered separately in the social subsystem (4.1.1.b) due to*	A key element of the NWI is integrated management of water for environmental and other public benefit outcomes (24 iv). The ecological subsystem is considered as water that is provided to meet agreed environmental and other public benefit outcomes as defined within relevant water plans (35). Statutory provisions are made to ensure environmental outcomes and improve environmental management (23 iii	*The ecological subsystem is recognised to a limited extent, mainly with regard to water bodies as such and water dependent ecosystems. Consequently, there needs to be broader recognition of ecological values to include not only directly water dependent ecosystems but*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			*the extensive influence we have on the water system. *It seems useful to explore the subsystems separately and in detail to facilitate better understanding, but it is important to take note of any interconnections with other subsystems so they can be taken into account (in 4.1.1.d). Trends need to be identified in order to anticipate change and prioritise actions. It may be useful to have a generic conceptual model of the system in question to guide exploration (the review of 4.1 could be a useful guide).*	& 35i).\nUnder the NWI surface and groundwater systems of high conservation value will be identified and acknowledged, and these systems are managed to protect and enhance those values (25 x).\nCommitment to return all over-allocated and overused systems to environmentally-sustainable levels of extraction (23 iv) or adjusted to meet environmental outcomes (43, 44).\nWater planning will provide for secure ecological outcomes by describing the benefits and defining appropriate water management arrangements (37 i).\nWater interceptions activities are identified in water plans (Schedule E 5 iv).\nIt is recognised that more knowledge is needed about the environmental impacts of land use activities that intercept water flows many of which do not require an access entitlement. Based on the findings appropriate measures will be taken to achieve environmental objectives (55 & 56).\nSignificant interception activities are recorded, thresholds calculated and water access entitlements applied as appropriate (57).\nEnvironmental externalities are managed through regulatory measures such as setting extraction limits and specifying conditions for water use (73 i).\nEnvironmental benefit outcomes need to be identified as specifically as possible and taken account of in water plans (78 i).	*also indirect effects and ecosystem services.\nThe need to identify the direction and rate of change of the ecological subsystem is not specifically recognised although audit and review processes could be used for this purpose. This should be remedied.*
	b.	Is the wellbeing, its state as well as the direction and rate of change, of the social	*The social subsystem refers to human endeavours, activities and institutions and the cycles they rely on as*	The social subsystem is considered in conjunction with the ecological system, termed 'other public benefit outcomes', so similar provisions and limitations apply as in 2.2.a.\nThe NWI will address future adjustment issues that may	*Social considerations are acknowledged in conjunction with environmental values, except for indigenous cultural and spiritual*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		subsystem and its component parts considered with regard to water?	*well as those that depend on human interaction (see also Chapter 2).* *Those concerns directly to do with physical survival are not strictly social but are included for the sake of simplicity. (See also* at 4.1.1)*	impact on water users and communities (23 ix). Indigenous needs in relation to water access and management are recognised (25 ix). Indigenous access to water resources will be provided according to relevant legislation and by including indigenous representation in water planning wherever possible and incorporating indigenous social, spiritual and customary considerations into water plans (52). Native title will be acknowledged and water allocated accordingly (53) and accounted for (54). Development of national guidelines for urban customers' water accounts that provide information on their water use relative to equivalent households in the community (66 iv). Achievement of full cost recovery for rural water surface and groundwater systems, except for some small community services that need to be maintained to meet social and public health obligations, making public the size of the subsidy (66 v). Significant adjustment issues affecting water access entitlement holders and communities that may arise from reductions in water availability as a result of implementing the reforms proposed in this Agreement are addressed (45, 97).	*values which are mentioned separately. Social issues appear to be dealt with as an aside, subservient to economic and market considerations.* *Social considerations need to be dealt with more explicitly and in more detail, ensuring they are given at least equal weight or in some cases precedence over economic considerations.*
	c.	Is the wellbeing, its state as well as the direction and rate of change, of the economic subsystem and its component parts considered with regard to water?	*The economic subsystem is arguably a subsystem of the social (or human) system but since economics appears to be of great importance to humans it is dealt with separately. This subsystem relates to the production, distribution and trade of goods and wealth and needs*	Some objectives relate to the enhancement of water access entitlements to provide security and commercial certainty; removal of barriers to trade and broadening and deepening of the water market to achieve an open trading market; clarification of risk assignment for the consumptive pool; and water accounting (23 i, v, vi & vii). Markets and trading as well as water pricing are two key elements of the NWI (24 ii & iii). Water resource accounting is a third (24 v). Water planning will provide for resource security outcomes	*A clear bias towards the economic subsystem exists which is taken into account to a much greater degree than the other two (11 of 22 pages in the Agreement are devoted to water markets, pricing and accounting). A better balance between all subsystems is needed. In contrast to the other subsystems there are provisions for a review*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* →*Improvements*
			to be related to water. (See * at 4.1.1)	by determining the shares in the consumptive pool and the rules to allocate water during the life of the plan 37 ii). Changes in consumptive water availability are covered by a risk assignment in which water access entitlements bear the risk of arising from reductions in water through new knowledge climate change or natural events, while after 2014 reductions arising from new knowledge are shared amongst the title holder and governments (48, 49, 50 & 51). It is recognised that more knowledge is needed about the economic impacts of land use activities that intercept water flows many of which do not require an access entitlement. Based on the findings appropriate measures will be taken to protect the integrity of the water access entitlements system (55 & 56). Significant interception activities are recorded, thresholds calculated and water access entitlements applied as appropriate (57). A whole section is devoted to water markets and trading (58 – 63) detailing the objectives (see above). Schedule F outlines the 'principles for trading rules'. Paragraphs 64 – 77 deal with best practice water pricing and institutional arrangements, in particular economically efficient and sustainable use of resources and assets, sufficient revenue stream, efficient water markets, user-pays principle and pricing transparency, good pricing outcomes and unallocated water (64). Examination of feasibility of market based mechanisms such as pricing to account for positive and negative environmental externalities associated with water use (73 ii) and implement pricing where feasible (73iii). Water resource accounting aims to ensure that adequate measurement, monitoring and reporting systems are in place to support public and investor confidence in the	*of economic impacts with adjustments made based on the findings.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				amount of water being traded, extracted for consumptive use and recovered and managed for environmental and other public benefit outcomes (80).	
	d.	Are the wellbeing, the state as well as the direction and rate of change, of the interactions of the subsystems and their component parts being considered with regard to water?	*All three subsystems interact and therefore it is an important if complex (and often neglected) task to fully explore the interactions of all subsystems to detect trends, opportunities and threats that arise from these interactions.*	It is the responsibility of governments to ensure that water is used in socially and economically beneficial ways that are environmentally sustainable (2). Water market and trading arrangements need to recognise and protect the needs of the environment (58 iv) and provide appropriate protection for third-party interests (58 v). Water pricing and institutional arrangements are implemented (64) to promote the economically efficient and sustainable use (i) of water resources (a), water infrastructure assets (b) and government resources devoted to the management of water (c). Full cost recovery for water services which can include the recovery of environmental externalities (65 ii). Achievement of full cost recovery for rural water surface and groundwater systems, except for some small community services that need to be maintained to meet social and public health obligations, making public the size of the subsidy (66 v). Proposals for investment into new or refurbished water infrastructure are assessed to be economically viable and ecologically sustainable (69). Optimisation of cost effectiveness of measures to provide water for environmental and other public benefit outcomes (78 iii). The ability for environmental water managers to trade water on a temporary market at times such water is not required to contribute towards environmental and other public benefit outcomes (79 i e). Where it is necessary to recover water to achieve modified	*Interactions of the subsystems are explored to a limited extent and this needs to be broadened considerably. Direction and rate of change is not referred to explicitly, with the exception of the economic system and over-allocated system. This should be addressed to enable comparison and progress evaluation.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				environmental and other public benefit outcomes the following principles for determining the most effective and efficient mix of water recovery measures is adopted: consideration of all available options for water recovery (such as increasing the efficiency of water infrastructure or management practices, purchase of water or behaviour changes) (a), socio-economic costs and benefits (including those on downstream users and wider NRM outcomes, e.g. water quality, salinity) of the most prospective options are assessed (b) and measures are selected primarily on the basis of cost-effectiveness with a view to manage socio-economic impacts (c). (see also 6.6.a) Regulatory approvals for water use will take into account environmental, social and economic impacts of use, including on downstream users (Schedule D 1 iii). The extraction, diversion or use of traded water can only be restricted to manage environmental impact; hydrological, water quality and hydrogeological impacts; delivery constraints; impacts on geographical features; or features of major indigenous, cultural heritage or spiritual significance (Schedule G 3). Trades have to result in sustainable yields being observed (Schedule G 5). Conditions relating to the management of long-term impacts on the environment and other users will be imposed on permitted trades in over-allocated systems (Schedule G 6).	
4.1.2	a.	Are the positive and negative outcomes of human activities identified as monetary and non-monetary values of	*In all three subsystems both monetary and non-monetary values exist (are assigned by humans). All of them are important for a fuller picture of the outcomes of human*	Assessment of the socio-economic costs and benefits of the most prospective options for water recovery, including on downstream users, and the implications for wider natural resource management outcomes (e.g. water quality, salinity) (79 ii b). Both monetary as well as non-monetary values are	*Costs and benefits are not clearly identified and need to be broadened especially with regard to non-monetary elements.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		water (= ecosystem services of water), so that the costs and benefits to human and ecological systems are reflected?	*activities, positive and negative, for both humans and ecological systems (since without functioning ecosystems human endeavours are impossible).*	considered exemplified by water resource accounting (80) although there is clearly more emphasis on monetary values (82) with non-monetary values being those associated with environmental and other public benefits and environmental water accounting (84, 85).	
4.1.3	a.	Are the ecosystem services of water fully considered?	*This needs to be done with regard to direct and indirect ecosystem services such as regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment 2005). All these services depend on water or are connected to it (see also Chapter 3.2).*	The ecosystem services of water are considered as environmental outcomes that include the maintenance of ecosystem function, biodiversity, water quality and river health targets and 'other public benefits' that consider mitigating pollution, public health, indigenous and cultural values, recreation, fisheries, tourism, navigation and amenity values (Schedule B(i)).	*Few ecosystem services of water are considered and they need to be explored and included more fully (see also 2.1). This includes the direct and indirect roles of water in climate, weather, plant growth, soil formation, nutrient cycling, etc. (see e.g. (Millennium Ecosystem Assessment 2005) for details.*
	b.	Are the economic activities that contribute to human/social wellbeing considered with regard to water?	*This is a more detailed look at the monetary values, as well as trade and commerce activities related to water in terms of their contribution to human wellbeing (could be part of 4.2.1.c and 4.2.3.b).*	Socio-economic analysis can be undertaken for water plans if required (Schedule E 6 ii). Economic activities are considered but not explicitly how they contribute to human or social wellbeing. An exception is the case of community service obligations that may need to be observed without achieving full cost recovery (66 v c).	*Economic activities are not linked to human wellbeing and this should be made more explicit throughout the document.*
	c.	Are the non-market activities that contribute to human/ social wellbeing	*A more detailed look at non-monetary values that contribute to human wellbeing and their*	The uses and users of water are identified in water plans (Schedule E 1 vi). 'Environmental and other public benefit outcomes' which refer to maintaining ecosystem function, biodiversity, water	*There is only limited recognition of non-monetary values and they should be identified more extensively, including indirect*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		considered with regard to water?	*relationship with water (could be part of 4.2.1.b, 4.2.2.a and 4.2.3.b).*	quality and river health targets as well as mitigation of pollution, public health, indigenous and cultural values, recreation, tourism, navigation and amenity values (Schedule B(i)) are considered in water plans as are the water management arrangements required to meet those outcomes (Schedule E 1 vii).	*ones.*
	d.	Are the interactions of the ecosystem services of water as well as their economic and non-market values considered?	*The interactions of the ecosystem services outlined in 4.2.3.a-c can oppose or negate each other and should be fully explored to anticipate or prevent serious implications for human and ecosystem wellbeing.*	Application of best available scientific knowledge and socio-economic analysis (if deemed necessary) in the preparation of water plans (Schedule E 6 ii). Opportunity for open and transparent identification and consideration of consumptive use, environmental, cultural and other public benefit issues (Schedule E 6 iii).	*The interactions of 3.4.a-c need to be explored more fully after taking the suggestions for each of them into consideration.*
	e.	Are all these elements considered in a local, regional, national and global context?	*All these elements (4.2.3.a to 4.2.3.d) need to be considered with regard to these levels to ascertain their influences and extent and how they are best approached or solved. These contexts may overlap or be discrete but it is likely that more than one level will apply and cross-scale influences will need to be considered (see e.g. Dietz, Ostrom et al. 2003).*	The local and regional contexts are covered through water plans (if one is prepared for an area). These should also reflect regional differences in water supply and existing knowledge. There are provisions made for transboundary systems, e.g. the MDB. The national context is taken care of through the adherence to the NWI. Water plans need to consider relevant regional natural resource management plans and cross jurisdictional plans (Schedule E 5 i) as well as impacts on users and environment downstream or out of its area of coverage (Schedule E 5 iii). Reference to broader regional natural resource management planning processes (Schedule E 6 iv).	*While the local and regional contexts are considered the global context is not considered but should be explored as well for a more complete picture.*
4.1.4	a.	Are the time frames long enough to capture all water	*This depends on the water system(s) that are affected and varies with the nature of*	Some actions and commitments are to be 'ongoing' (Schedule A), but timeframes are not specified. Most actions and commitments are planned for the next 5-10	*Timeframes are set to deal with implementation and administration but have little to do with water*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		system (hydrological cycle) time scales?	*the assessed item and the spatial scale. However, all water systems and cycles are interdependent, which needs to be realised and acknowledged.* *Since it is not practical to do a full assessment of all water cycles in all systems in all cases, a full inventory of water cycles and their interactions should be available elsewhere for reference.*	years (Schedule A). Environmental and other public benefit outcomes are given at least the same degree of security as water access entitlements (35 i). Best available science will be used in preparation of statutory water plans (36). Water planning will provide for secure ecological outcomes and resource security outcomes (37 i & ii) subject to a decision if a plan is required (38). Plan duration to be consistent with the level of knowledge and development of a particular water source (Schedule E 3).	*cycles. Better exploration of all water cycles and their associated time frames is needed which should be reflected in the policy as well as in water plans.*
	b.	Are time scales appropriate to cater for future generations?	*This implies multiples of a human generation length (~25yrs).*	Water access entitlements are statutorily guaranteed and can be passed on to future generations (31). Some actions and commitments are to be 'ongoing' (Schedule A), but timeframes are not specified. Most actions and commitments are planned for the next 5-10 years (Schedule A). Timeframes for plans and reviews are decided by the States and Territories if a plan is deemed necessary (38). There is reference made to sustainable use (64 i) of water resources (a), water infrastructure assets (b) and government resources devoted to management of water (c).	*Timeframes should be specified more clearly, e.g. how long is 'ongoing' (Schedule A)? There is one reference to sustainable use of water resources, water infrastructure assets and government resources (s.64i) as well as provision for secure ecological outcomes and resource security outcomes through water planning (s.37i&ii) in case the decision is made that a plan is required (s.38). This is not sufficient as a commitment to long-term management and to future generations; such a commitment needs to be formulated and expressed clearly.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
	c.	Are time scales appropriate for current short-term decision making?	*Should be suitable for the case in question and may include election or review cycles.*	Most actions and commitments are planned for the next 5-10 years (Schedule A and throughout the document). Consideration of and synchronisation with cross-jurisdictional water planning cycles (Schedule E 6 v). Annual reporting on benchmarking of pricing and service quality for water delivery agencies (75). Annual reporting of environmental water rules, their activation and implementation as well as overall effectiveness of resource use with regard to environmental and other public benefit outcomes (85 ii).	*Time scales appear to be appropriate for short-term decision making.*
4.1.5	a.	Is the spatial frame of reference sufficiently large to include both local and long distance impacts on water systems?	*Long distance and cross-scale influences (atmospheric, groundwater, rivers) can have great importance on local conditions and vice versa. Even if the assessment is for a small area the broader picture needs to be captured so that these influences can be ascertained (see also 4.2.3e).*	The entire document aims for national compatibility water resource management system (23). Water access entitlements and planning frameworks will reflect regional differences in water supply and state of knowledge (25 viii). The Southern Murray-Darling Basin is administered by the Murray-Darling Basin Ministerial Council that committed to consider relevant issues (especially for trade) for the whole basin (63). The spatial extent of water plans is determined on a case by case basis (38) depending on the water source for which a plan is prepared (Schedule E 1 i).	*Local and regional impacts of water abstraction, interception and use are considered sufficiently. However, other more long distance elements including air and vapour movements or climate change are not mentioned but should be accounted for. Effects of trade within the MDB12 are considered but effects of inter-basin water trading also need to be included.*
4.1.6	a.	Are historic considerations included in anticipating future conditions of water?	*Includes traditional, cultural, ecological, spiritual, legal, commercial, political and administrative heritage and their relationships to water. Their influence may be past or ongoing but all need to be considered for potential*	Indigenous access to water resources is provided (52) and water plans will incorporate indigenous social, spiritual and customary objectives and strategies (ii). Water allocated to native title holders for traditional cultural purposes will be accounted for (54). 'Environmental and other public benefit outcomes' include indigenous and cultural values (Schedule B(i) and B(ii)). In water plans the uses and users of the water including	*Besides indigenous cultural and customary water uses, which are taken into account to some extent in water allocation, there is no mention of any other heritage except that of some 'water sensitive urban design icons' (s.92 iii) and legacies to do with*

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		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			effect of the future of water systems.	consideration of indigenous water use are taken into consideration (Schedule E vi). Trading rules will be established taking into consideration features of major indigenous, cultural heritage or spiritual significance (Schedule G v). Review of existing cross-jurisdictional water sharing agreements to ensure their consistency with this Agreement (13). Implementing the entitlements and allocation framework will require (26) to complete plans to address any existing overallocation for all river systems and groundwater resources in accordance with commitments under the 1994 COAG water reform framework (i), update existing water entitlement frameworks so they concur with this one (ii) and review existing plans for concurrence (iii). The Parties note that existing commitments under National Competition Policy (ref. COAG Tripartite Agreement Clause 1) arrangements require that allocations to provide a better balance in water resource use (including appropriate allocations to the environment) for all river systems and groundwater resources which have been over-allocated or are deemed to be stressed and identified in their agreed National Competition Council (NCC) endorsed individual implementation programs, must be substantially completed by 2005 (41). Existing institutional barriers to water trade are removed (60 iv). As part of the support for trading the existing product mix is analysed (61 ii). Achievement of *lower bound pricing* for all rural systems in line with existing NCP commitments as part of full cost recovery of water supply (66 v a). Release of unallocated water should occur only where	*administration, accounting and previous over-allocation of water. Historic considerations need to be expanded to include post-immigration history, previous ecological conditions besides those threatened by over-allocation and effects of existing administrative boundaries.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				alternative ways of meeting water demands, such as through water trading, making use of the unused parts of existing entitlements or by increasing water use efficiency, have been fully explored (71). Benchmarking reports of pricing and service quality for water delivery agencies need to take into account existing information collection including (75): all metropolitan inter-agency performance and benchmarking system managed by the Water Services Association of Australia (i and ii) and the irrigation industry performance monitoring and benchmarking system, currently being managed by the Australian National Committee on Irrigation and Drainage (iii). Evaluate existing 'icon water sensitive urban developments' to identify gaps in knowledge and lessons for future strategically located developments (932 iii). The NWC will undertake a baseline assessment of the water resource and governance arrangements, based on existing work by the Parties and undertaking further work only where required (105 i).	
	b.	Are current conditions of water systems considered in anticipating future conditions?	*The current state of the water system, in terms of water availability, quality, hydrogeology, ecology as well as allocation status, can determine future outcomes and needs to be documented and assessed, also as a reference point.*	The States and Territories agree to continue to manage environmental externalities through a range of regulatory measures (such as through setting extraction limits in water management plans and by specifying the conditions for the use of water in water use licences)(73 i). Development of a compatible register of new and existing environmental water (consistent with paragraph 35) showing all relevant details of source, location, volume, security, use, environmental outcomes sought and type (85 i). The NRMMC will in consultation with the NWC develop a comprehensive national set of performance indicators for this Agreement. The indicators should, where possible,	*While some existing conditions are considered (those related to environmental water and over-allocated systems), they are all pertaining to blue water and there needs to be more information about indirect aspects, such as ecosystem services of water, green and virtual water, as well as waste water (grey and black).*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				draw on existing indicators and include initialisation of *water access entitlements*, environmental water, water use efficiency, water pricing and water trading (104 ii). The NWC is undertaking a baseline assessment of existing water resources and governance arrangements; further work is done if required (105 i). Current health and condition of a water system are considered in the preparation of water plans (Schedule E 1 ii). Risks that could affect the size of the water resource and the allocation of water for consumptive use are identified (e.g. natural events & climate change, land use change, limitations of knowledge) (Schedule E1iii). The uses and users of water are identified in water plans (Schedule E 1 vi). The estimated reliability of the water access entitlement (Schedule E 1 viii). Where the systems are found to be over-allocated or overused, the relevant plan should set out a pathway to correct the overallocation or overuse (paragraphs 41-45 refers) (Schedule E 2). Schedule F outlines the water registers that contain info about water access entitlements (established under NWI). Trades within over-allocated water sources (including groundwater sources) may be permitted in some cases subject to conditions to manage long-term impacts on the environment and other users (Schedule G 6). Trade from a licensed runoff harvesting dam (i.e. not a small farm dam) to a river may occur subject to (Schedule G 10) a reduction in dam capacity consistent with the transferred water entitlement (i); retention of sufficient capacity to accommodate evaporative and infiltration losses (ii); or conditions specified in water plans to protect the	

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				environment (iii).	
	c.	Where could we go? Are all possibilities and alternatives considered?	*All scenarios and possibilities, including the 'no change' option and utopian ones, can be informative and inspiring and need to be explored to ensure that fully informed decisions are made.*	As part of the support for trading a study to facilitate cross system compatibility, that analyses the existing product mix, proposes possible choices of product mix, makes recommendations on the desirable model and proposes a transition path for implementation is completed (61 ii). Where full cost recovery is unlikely to be achieved in the long term and a Community Service Obligation (CSO) is deemed necessary, the size of the subsidy is to be reported publicly and, where practicable, jurisdictions to consider alternative management arrangements aimed at removing the need for an ongoing CSO (66 v c). If a release of unallocated water is justified, generally, it should occur only where alternative ways of meeting water demands, such as through water trading, making use of the unused parts of existing entitlements or by increasing water use efficiency, have been fully explored (71). Where it is necessary to recover water to achieve modified *environmental and other public benefit outcomes*, to adopt the following principles for determining the most effective and efficient mix of water recovery measures (79 ii): a) consideration of all available options for water recovery, including: − investment in more efficient water infrastructure; − purchase of water on the market, by tender or other market based mechanisms; − investment in more efficient water management practices, including measurement; or − investment in behavioural change to reduce urban water consumption; b) assessment of the socio-economic costs and benefits of the most prospective options, including on downstream users, and the implications for wider natural resource management outcomes (e.g. impacts on water quality or salinity); and c) selection of measures primarily on the basis of cost-	*Some possibilities are explored but there is no open and full exploration of all possible options, e.g. there is no question if water markets are the best option and other alternatives are not even mentioned. It is also unclear if different options are explored in the preparation of water plans. In the preparation of plans a full exploration of all possible models and options, even those that appear utopian or impossible, should occur (in a participatory manner) so that the best possible one can be chosen. Overall, a public debate with regard to water planning and management should be continuous exploring alternative options besides and including water markets.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				effectiveness, and with a view to managing socio-economic impacts. Develop national guidelines for evaluating options for water sensitive urban developments, both in new urban sub-divisions and high rise buildings (92ii). In water plans impacts on water users and the environment need to be considered that the plan may have downstream (including estuaries) or out of its area of coverage, within or across jurisdictions (Schedule E 5 iii).	
4.1.7	a.	Is an explicit set of categories or an organising framework employed that links vision and goals to indicators and assessment criteria?	*A clear framework can help with identifying meaningful indicators and aid assessment (e.g. Peet and Bossel 2000); this needs to be linked to the vision and goals to ensure that intended outcomes are achieved. Review framework and indicators regularly for appropriateness.*	A comprehensive set of performance indicators will be developed (or was supposed to be by mid 2005; find out!) by the NRMMC and the NWC based on existing indicators and includes initialisation of water access entitlements, environmental water, water use efficiency, water pricing and water trading (104 ii).	*There is no set of categories or framework suggested for use in the set of performance indicators, but it remains to be seen how this task is completed. A framework or similar should be employed for consistency and coherency.*
	b.	Do the set of categories or the organising framework have water as a central concern and are the indicators and assessment criteria related to the water system?	*The framework has to ensure that water is made a central concern and the indicators or the assessment criteria need to be chosen accordingly. While this would include obviously water-related elements, given that water is relevant for most aspects of interest to humans, at least indirectly, many 'non-water' aspects*	Water is considered in the framework and most indicators will apparently relate to it, but it is unsure to what extent water will be made central.	*The framework recommended in 4.1.7.a should be designed so that water is of central concern and that all indicators reflect that.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			could also be valid.		
4.1.7.1	a.	Are a limited number of key issues used for analysis?	*A limited number of key issues help reduce complexity. Ensure that key issues are correct and applicable through an inclusive participatory process.*	There are 8 key elements identified in the NWI (24).	*There is a limited set of key issues (s.24) but they are also limited in scope: 4 of 8 elements deal with entitlements, markets, pricing and accounting. The other 4 deal with 'integrated management for environmental and other public benefit outcomes', urban water reform, knowledge and capacity building, and community partnerships and adjustments. There should be a better balance and spread of issues.*
	b.	Are these key issues related to water and *Water Centrality?*	*While most issues are related to water, at least indirectly, those that have the most obvious and relevant connections to the Water Centrality Principles should be chosen.*	All the key issues relate to water and all are related to water centrality. However, those key issues concerned with entitlements, markets, pricing and accounting (4 of 8 key issues) only cover part of one of the WCP while 'integrated management for environmental and other public benefit outcomes', 'urban water reform', 'knowledge and capacity building' and 'community partnerships and adjustments' are better reflecting the spirit of water centrality.	*The key issues should be chosen to reflect the WCP better, without overly emphasising one principle or issue, as is the case here (see 4.1.7.1a). A better representation of the WCP would be desirable to better reflect e.g. equity or transparency.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
4.1.7.2	a.	Are a limited number of indicators or indicator combinations used that provide a clear sign of progress towards *Water Centrality*?	*Fewer indicators limit complexity, but they need to be relevant to what is assessed, in this case progress towards* Water Centrality. *A policy may not need to be descriptive in detail but should ensure guidance if subsequent processes or documents need to deal with this.*	Not yet; to be developed by the NRMMC and the NWC (see 4.2.7.a). (Check on progress!)	*N/A at present. Indicators to be developed by the NRMMC and NWC;* Water Centrality *Principles should be used as a guide.*
4.1.7.3	a.	Are measurements standardised wherever possible to allow comparison?	*Standardisation is usually not a problem for quantifiable measurements but can be more difficult for some qualitative data. Comparison is important for monitoring progress and trends.*	Metering and measuring of water, where applicable, is standardised (87, 88, 89).	*Only with regard to metered water is there reference to standardised measurements. There is no mention of other measurements, but measurement and monitoring of environmental and social requirements and for non-metered water (including green water) should be included. Measures do not have to be only quantitative.*
	b.	Do these measurements relate to water?	*Although most measurements can be related to water, at least indirectly, the most appropriate and relevant should be chosen.*	*Yes, but to a very limited extent.*	*When broadening the scope of measurements (see 4.1.7.3a) they should relate to water and the WCP.*
4.1.7.4	a.	Are indicator values compared to targets, reference values, ranges, thresholds or	*Comparison is paramount to assess progress and trends. Indicators can be quantitative or qualitative*	Not referred to and probably not applicable.	*While indicator values are not directly a concern of this policy, a recommendation to compare indicator values to targets,*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls →Improvements*
		directions of trends, as appropriate?	*and include not only bio-physical and socio-economic but also political measures, e.g. policy and legislation. Performance targets should be complemented by information targets[13] to allow for ongoing evaluation and course corrections.*		*reference values, ranges, thresholds or directions of trends would be useful to ensure that this occurs in water plans.*
	b.	Do these values relate to the water system?	*Indicator values as well as target values should be related to the water system as explicitly as possible.*	See 4.1.7.4a	*It should also be ensured that these indicator values relate to the water system, directly and indirectly.*
4.1.8	a.	Is information drawn from indicators and other tools that are stimulating and serve to engage decision-makers?	*Meaningful and relevant information is best, but may not be readily available and an ongoing search for information and knowledge is needed (see 5.2.1). Decision makers need to be interested to ensure ongoing involvement, commitment and appropriate decisions.*	Remains to be seen once the performance indicators are in place (re 104 ii). Further advise on indicators is not given (e.g. for use in water plans or reviews).	*Any information derived from indicators and other tools should be relevant and of interest to decision makers.*
	b.	Is this information related to water?	*All information derived from indicators and other tools should be related to water to show their connections, especially when these are indirect.*	See 4.1.8.a	*Such information should all be related to water and show the connections with water in case this is not obvious, as e.g. for indirect values.*

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[13] Information targets are indicator points that are set throughout a project to gauge progress that can include quantitative as well as qualitative information concerning targets but also players, processes and structures Westley, F., B. Zimmerman, et al. (2006). Getting to maybe: how the world is changed. Canada, Random House..

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
4.2	a.	Are the increasing complexity of water issues, appropriate policies and actions taken into account so that they become coherent, consistent and easily understood?	*Increasing complexity of water issues, in terms of institutions, increased competition due to population growth, markets, etc., needs to be identified and documented or otherwise made explicit. Existing policies and actions need to be outlined and their relationship to each other as well as to the assessed items explained clearly. An understandable picture of the overall situation should be created that shows how all parts work together, identifying inconsistencies so they can be addressed. Findings from 4.1 form the basis for this.*	There is recognition that water resources in Australia are highly variable depending on climate and terrain but also on level of development (1). Parts of the water system mentioned are: c. rivers and catchments; d. surface and groundwater resources; e. urban and rural areas; f. indigenous water needs; g. consumptive use; h. environmental and public benefit outcomes; i. protection of water sources and water dependent ecosystems; j. high conservation value systems; k. currently over-allocated and overused systems; l. water access entitlements; m. water markets and trading; n. water pricing; o. community service obligations (CSO); p. and use change activities without water access entitlement e.g. farm dams and bores, intercept and storage of overland flows and large scale plantation forestry; q. new or refurbished water infrastructure; r. environmental externalities; s. irrigation industry; t. treatment of industrial waste; u. recycled water and stormwater; v. integrated management of environmental water. Interconnections are only addressed specifically with regard to surface and groundwater systems (4). The NWI is directed towards consumptive water and economic efficiency considerations. Some consideration is given to environmental and social aspects however other parts of the water system, such as rainfall, water vapour	*The complexity of water systems is recognised to a certain extent but should be acknowledged to a greater degree beyond geographic and climatic variability and the 'mere' balancing of economic, environmental and social aspects and groundwater-surface water system interconnections* *Although nationwide compatibility of WRM is stated as the main aim this is mainly envisaged for trading, markets and water accounting. Environmental considerations should be broadened to include wider ecosystem services.* *The national registers of allocations and environmental water as well as the improved coordination of data collection and management are only the start for a truly coherent approach and should be expanded to include research, policy and planning as well as be tied in with other legislation.* *Reference is made to the COAG water reform framework (1994) but other relevant policies and initiatives, e.g. the National Strategy for ESD (1992), are not mentioned, although they are still*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
				and the receiving oceans, are completely ignored. There is also little concern for waste water or water pollution, although there is reference to the National Action Plan for Salinity and Water Quality and the National Water Quality Management Strategy (7). (57 i) in water systems that are fully allocated, *over-allocated*, or approaching full allocation: a) interception activities that are assessed as being significant should be recorded (for example, through a licensing system); b) any proposals for additional interception activities above an agreed threshold size, will require a *water access entitlement*: − the threshold size will be determined for the entire water system covered by a *water plan*, having regard to regional circumstances and taking account of both the positive and negative impacts of water interception on regional (including cross-border) natural resource management outcomes (for example, the control of rising water tables by plantations); (57 ii) in water systems that are not yet fully allocated, or approaching full allocation: a) significant interception activities should be identified and estimates made of the amount of water likely to be intercepted by those activities over the life of the relevant water plan; b) an appropriate threshold level will be calculated of water interception by the significant interception activities that is allowable without a *water access entitlement* across the entire water system covered by the plan: − this threshold level should be determined as per paragraph 57(i)b) above; and c) progress of the catchment or aquifer towards either full allocation or the threshold level of interception should be regularly monitored and publicly reported: − once the threshold level of interception is reached, or the system is approaching full	*relevant and applicable today and forerunners for this Agreement (see also 3.1.2.a).*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				allocation, all additional proposals for significant interception activities will require a *water access entitlement* unless for activities for restricted purposes, such as contaminated water from intensive livestock operations. (78) The Parties agree that the outcome for integrated management of environmental water is to identify within water resource planning frameworks the *environmental and other public benefit outcomes* sought for water systems and to develop and implement management practices and institutional arrangements that will achieve those outcomes by: (i) identifying the desired *environmental and other public benefit outcomes* with as much specificity as possible. (82 iii) water resource accounts that can be reconciled annually and aggregated to produce a national water balance, including: a) a water balance covering all significant water use, for all managed water resource systems; b) systems to integrate the accounting of groundwater and surface water use where close interaction between groundwater aquifers and streamflow exist; and c) consideration of land use change, climate change and other externalities as elements of the water balance. (91 iv) prioritise and implement, where cost effective, management responses to water supply and discharge system losses including leakage, excess pressure, overflows and other maintenance needs.	
5		**Ongoing Responsiveness and Efficiency**			
5.1	a.	Do institutions and processes serve all stakeholders, including water?	*It is important that institutions and processes do not exclude any stakeholders either by design or*	The Parties agree to implement this National Water Initiative (NWI) in recognition of the continuing national imperative to increase the productivity and efficiency of Australia's water use, the need to service rural and urban	*The Agreement's intention is to serve all relevant stakeholders including the environment; however, it is very much biased*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			inadvertence; they need to be inclusive (see also 2.1)ensuring that water is considered as a 'stakeholder' with reluctant parties also being identified and included as far as possible.	communities, and to ensure the health of river and groundwater systems by establishing clear pathways to return all systems to environmentally sustainable levels of extraction. The objective of the Parties in implementing this Agreement is to provide greater certainty for investment and the environment, and underpin the capacity of Australia's water management regimes to deal with change responsively and fairly (refer paragraph 23) (5). Since this agreement is on water it is represented, but in a limited way.	*towards markets and economic considerations. It is also hazy with regard to some details concerning community participation and ecosystem services other than those related to blue surface water and ground water.* *More detail with regard to stakeholders is needed and the approach to water needs to be less biased towards market and economics and has to be broadened (see 2.1 and elsewhere). Water should be seen in a much broader context and all its values considered. It should be regarded as a stakeholder, not merely a resource.*
	b.	Are institutions and processes responsive to change and uncertainty with particular attention to water?	*Ongoing monitoring and review needs to be ensured (through expertise, finances, administration, processes, etc.) and new insights and knowledge need to be incorporated on an ongoing basis to effectively deal with change and uncertainty (e.g. Pahl-Wostl, Sendzimir et al. 2007) (see also 5.1.1 and 5.1.2). This needs to occur with particular attention to water in its direct and indirect guises, ensuring that*	There is a commitment to address future adjustment issues that may impact on water users and communities (23 ix) and to provide for adaptive management of surface and groundwater systems (25 iv). There is provision for risk assignment in anticipation of future changes to the consumptive pool (23 vi). In poorly understood or undeveloped areas there is an ongoing process to assess the risks of expected development and demand on resources (33 ii). The NWC will provide biannual progress reports and advice to the parties on implementation (Schedule C). Requirement to indicate how the knowledge base for allocation and environmental requirement decisions is improved over the life of a water plan (Schedule E 1 v). Regular public reporting is part of the implementation of	*The commitment to adaptive management is biased towards the consumptive pool and although other aspects are included there needs to be a broader approach to risk and uncertainty, also taking into consideration indirect ecosystem services of water and other forms of water besides blue surface and groundwater.* *There is little reference to institutions and their adaptiveness, which should be rectified so that adaptiveness is built into both processes and institutions alike;*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			no important issue is overlooked or under attended.	water plans designed to manage risk and give early indications of changes to the consumptive pool (40 iii). With regard to the MDB the NWC monitors the impacts of interstate trade and advises parties of any issues arising (63 vi). Periodic independent audit, review and public reporting of the achievement of environmental and other public benefit outcomes and the adequacy of water provision and management arrangements in achieving these outcomes (79 i d). In case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge (Schedule E 4).	*this may require a separate policy or guidance document. All these adjustments should ensure that particular attention is given to changes and uncertainties relating to the water system.*
5.1.1	a.	Does the capacity exist to determine trends through measurements that are iterative, adaptive and repetitive?	*The capacity to undertake regular review and analysis of trends as well as making the necessary adaptations needs to be provided. This requires adequate human, financial and procedural resources.*	Monitoring the performance of water plan objectives, outcomes and water management arrangements is part of the implementation of water plans (40 i). Regular monitoring of interception activities is undertaken (57 i c & ii c). Periodic independent audit, review and public reporting of the achievement of environmental and other public benefit outcomes and the adequacy of water provision and management arrangements in achieving these outcomes (79 I d). The NWC has the ability to use staff and consultants (Schedule C). Regulatory approval authorities have the necessary legal authority and resources to monitor and enforce the conditions of water use or works licenses (Schedule D 2 ii). In case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge (Schedule E 4).	*The requirement for monitoring, audit and review exist, however there is little specific reference to capacity besides the implied abilities of the NWC, the parties' staff and consultants that may be used to carry out review and assessments. There should be some reference to the capacity and ability of reviewers and also how often these audits and reviews occur and what happens with the results, especially in case of negative outcomes. A commitment to adaptiveness may also be usefully made in a separate document since it also may entail some broader restructuring of government institutions.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	b.	Do the measurements show the effects on the water system?	*Measurements should be made with their relevance to the water system in mind; highly relevant ones should be preferred if possible and appropriate, depending on the context; if the measures relate indirectly to water only this may be more difficult.*	Yes, the measurements show effects on the water system, but the extent of this is unclear since this would depend on the water plans and their arrangements.	*It should be ensured that the water plan objectives as well as audits and reviews are using measurements that clearly show effects on the water system.*
5.1.2	a.	Is there commitment to ongoing review of performance?	*Performance review is a standard process in a responsible institution or organisation. It makes review meaningful, especially if findings are translated into useful adaptation and change; this should occur with particular emphasis on water and Water Centrality.*	The NRMMC provides annual reports to COAG on NWI implementation progress (104 i). Implementation plans are assessed by the NWC for NWI objectives and outcomes within agreed timeframes (105 iii). The NWC will assess progress with the NWI Agreement and the implementation plans biannually and advise on necessary actions (106 a), undertake a third biannual assessment as a major review of progress against the NRMMC indicators as well as contributions and impacts on the national interest and communities (106 b). Biannual assessments by the NWC of the water industry with regard to meeting national benchmarks in irrigation efficiency, water management costs and water pricing (106 c). The operation and objectives of the NWC will be reviewed in 2011 by COAG (108).	*Performance review seems well established, but is mainly related to implementation and the performance of the water industry regarding pricing, irrigation efficiency and water management. It is unclear what happens in cases of insufficient progress or non-compliance and information should be provided for such eventualities. Overall, there should be more emphasis on the water system and a much broader context that also includes the community and other government organisations.*
	b.	Are goals, frameworks, processes and indicators adjustable in light of new insights and	*New knowledge, particularly that related to water, needs to be distributed and incorporated where applicable so that changes can be made as appropriate.*	Existing legislation is adjusted with regard to the entitlements and allocation framework (26 ii) and current plans are reviewed to ensure they meet the requirements of the NWI with regard to process transparency, reporting arrangements and risk assignment (26 iii). Other adjustments to existing legislation and administrative	*There is no reference to adjustment of goals or indicators, with regard to any new knowledge. While too much detail may not be applicable here goals should be adjustable and the whole*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		emergence of traditional knowledge with emphasis on water?	*This has to be ongoing and enshrined in review processes.*	procedures are made as necessary (27). Drawing on the NWC assessment in 2010-11, COAG will review the objectives and operation of the NWC in 2011 (108). Requirement to indicate how the knowledge base for allocation and environmental requirement decisions is improved over the life of a water plan (Schedule E 1 v). In case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge (Schedule E 4).	*agreement should be open to review and adjustment, not just the NWC. Such review should place particular emphasis on new and emerging knowledge that relates to water.*
5.1.3	a.	Is feedback on decision making encouraged with particular attention to water?	*Feedback ensures that problems with decisions are detected before they escalate. Changes can be made if appropriate and ultimately acceptability of decisions and outcomes to stakeholders can be increased. Particular attention should be on water.*	Regular public reporting is part of the implementation of water plans designed to manage risk and give early indications of changes to the consumptive pool (40 iii). Approval processes need to be contestable (Schedule D 1 vii) and decisions can be appealed (Schedule D 1 viii). Practices (includes decision making) of authorities responsible for regulatory approvals are subject to periodic benchmarking of practices by peer authorities of other jurisdictions (Schedule D 2. iii).	*There are certain avenues for appeal and community input, but feedback on decision making is not encouraged specifically. Consideration to feedback should be given and avenues put in place to enable and encourage feedback on decisions, particularly those relating to water beyond those provided through consultation processes. This may require another separate process and guidance as part of the establishment of a water society.*
5.2	a.	Is collective learning and its development promoted?	*Collective learning is not only based on review but entails active seeking of new ways of doing and new and hidden or obscured knowledge (e.g. Pahl-Wostl, Sendzimir et al. 2007).*	Knowledge improvement is factored into the implementation of water plans (40 ii). Knowledge and capacity building is a key element (24 vii) with specific needs specified in regional water accounts, changes in water availability, interaction between surface and groundwater, ecological outcomes from environmental flows, improvements in water use efficiency, catchment	*Search for knowledge is encouraged and priorities will be identified, but there is no information about who is involved. Both knowledge seeking and learning needs to involve the community and partnerships in*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				processes that impact on water quality and independent reviews of the knowledge base (98). Significant national investments in knowledge and capacity building in water exist already (99). 101. Parties agree to: i) identify the key knowledge and capacity building priorities needed to support ongoing implementation of this Agreement; and ii) identify and implement proposals to more effectively coordinate the national water knowledge effort. Requirement to indicate how the knowledge base for allocation and environmental requirement decisions is improved over the life of a water plan (Schedule E 1 v).	*learning should be promoted.*
	b.	Is collective learning emphasising and relating to water?	*Any learning should be related to and emphasise the connections to water to promote awareness of* Water Centrality *and water relationships (see e.g. Centre for Ecoliteracy 2000).*	Knowledge and capacity building is a key element (24 vii) with specific needs specified in regional water accounts, changes in water availability, interaction between surface and groundwater, ecological outcomes from environmental flows, improvements in water use efficiency, catchment processes that impact on water quality and independent reviews of the knowledge base (98). Requirement to indicate how the knowledge base for allocation and environmental requirement decisions is improved over the life of a water plan (Schedule E 1 v).	*There is emphasis on learning about water and the water system with certain specific needs identified. What is missing is commitment to learning and facilitation of water literacy, which should involve the whole nation at all levels, not only the research institutions (see 5.2.1).*
5.2.1	a.	Is there commitment to ongoing search for new, traditional and indigenous knowledge?	*The discovery of knowledge needs to be supported on an ongoing basis to ensure long-term increase of knowledge which allows for the best possible decisions to be made.*	This Agreement identifies a number of areas where there are significant knowledge and capacity building needs for its ongoing implementation. These include: regional water accounts and assessment of availability through time and across catchments; changes to water availability from climate and land use change; interaction between surface and groundwater components of the water cycle; demonstrating ecological outcomes from environmental flow management; improvements in farm, irrigation system and catchment water use efficiency; catchment processes	*The search for knowledge seems well enshrined but should explicitly include traditional and indigenous knowledge.*

		Water Centrality Questions	**Expectations**	**Assessment (how is it done?)**	**Shortfalls → Improvements**
				that impact on water quality; improvements in urban water use efficiency; and independent reviews of the knowledge base (98). There are significant national investments in knowledge and capacity building in water, including through the Cooperative Research programme, CSIRO Water Flagship and Land and Water Australia, State agencies, local government and higher education institutions. Scientific, technical and social aspects of water management are multi-disciplinary and extend beyond the capacity of any single research institution (99). Parties agree to (101): identify the key knowledge and capacity building priorities needed to support ongoing implementation of this Agreement (i); and identify and implement proposals to more effectively coordinate the national water knowledge effort (ii).This occurs on an ongoing basis (Schedule A). Water plans need to identify the knowledge base upon which decisions about allocations and requirements for the environment are being made, and an indication of how this base is to be improved during the course of the plan (Schedule E 1 v).	
	b.	Is the ongoing search for knowledge emphasising water?	*Water-related knowledge and the knowledge of water relationships are particularly pertinent to* Water Centrality *and should be fostered specifically.*	See 5.2.1a	*Much of the agreed knowledge seeking concerns water, although the more indirect connections with water could be strengthened.*
5.3	a.	Are decisions made with the aim of achieving economic efficiency, ecological	*It is important to meet the needs of stakeholders and users while making the best use of available resources*	Where it is necessary to recover water to achieve modified environmental and other public benefit outcomes the following principles for determining the most effective and efficient mix of water recovery measures is adopted:	*Economic efficiency is a high priority throughout the NWI but it should be broadened and strengthened together with*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
		effectiveness and a functional water system?	*(which are usually limited) and doing the least possible harm to the environment and the water system in the process.*	consideration of all available options for water recovery (such as increasing the efficiency of water infrastructure or management practices, purchase of water or behaviour changes) (a), socio-economic costs and benefits (including those on downstream users and wider NRM outcomes, e.g. water quality, salinity) of the most prospective options are assessed (b) and measures are selected primarily on the basis of cost-effectiveness with a view to manage socio-economic impacts (c). (see also 2.2d)	*ecological effectiveness to include other forms of water and indirect ecosystem services to ensure a functional whole water system.*
6		**Institutional and Community[14] Capacity**			
6.1	a.	Is ongoing support in the decision making process provided?	*Guidance for decision making should be provided to organisations and individuals as appropriate to ensure that well informed, practical and reasonable decisions are made that suit the situation. Support also includes appropriate human and other resources and capacity.*	Water planning is an important mechanism to assist governments and the community to determine water management and allocation decisions (36). Establishment of effective and efficient management and institutional arrangements to ensure that environmental and public benefit outcomes are achieved (79 i). This includes environmental water managers (79 i a), arrangement for shared and interconnected resources (79 i b & c) and any special requirements to sustain high conservation value water areas (79 i f). Water users and other stakeholders are engaged in achieving the objectives of this Agreement to ensure that sound information is available to all sectors at key decision points (93 iii). Water plans outline the knowledge base upon which decisions about allocations and requirements for the environment are being made, and an indication of how this base is to be improved during the course of the plan	*There is little indication given about support in decision making processes and more information should be provided to ensure that decisions are consistent and well-founded.*

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[14] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others Adams, D. and M. Hess (2001) Community in public policy: fad or foundation? *Australian Journal of Public Administration* **60**, 13-23 DOI: 10.1111/1467-8500.00205.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				(Schedule E 1 v).	
	b.	Is ongoing decision support highlighting water?	*Any decision support should ensure that water is considered, directly or indirectly, as appropriate.*	See 6.1a.	*Decision support should be suitable for water and ensure that all water values and direct and indirect concerns are considered as appropriate.*
6.2	a.	Is institutional capacity for data collection, maintenance and documentation as well as for auditing these provided?	*Basic prerequisites such as facilities, training, human and financial resources as well as processes need to be available on an ongoing basis (see also 6.3).*	Yes, there are resources and capabilities allocated. Establishment of a National Water Commission that has an office, can employ staff and use the parties' staff, and can use consultants (NWC) (10 & Schedule C). Compatible, publicly accessible and reliable water registers of all water access entitlements and trades will be kept by the states (59 & Schedule F). Establishing and equipping accountable *environmental water managers* with the necessary authority and resources to provide sufficient water at the right times and places to achieve the *environmental and other public benefit outcomes*, including across State/Territory boundaries where relevant (79 ii). Provision of accurate and timely information to relevant stakeholders on progress of water plan implementation and other relevant issues for the security of water access entitlements and the sustainability of water use including scientific information on the identification and implementation of environmental and other public benefit outcomes (96). The Parties also agree that the authority responsible for regulatory approvals needs to have the necessary legal authority and resources to monitor and enforce the conditions of a water use or works licence (Schedule D 2 ii).	*Sufficient institutional capacity seems to be provided, although there appear to be many assumptions with regard to provision of capacity by the states as well as in the NWC that are not spelled out. Although details on this may not be necessary some general reference to appropriate capacity should be made (which also includes the appropriate resources).*
	b.	Is institutional	*Facilities, training, human*	See 6.2b.	*Although there are some water*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		capacity for data collection, maintenance, documentation and auditing appropriate for water?	*and financial resources as well as processes need to be designed so that water issues are considered throughout and as appropriate for direct and indirect water issues.*		*specific provisions made for institutional capacity, they may have to be broadened to ensure that the whole water system with its direct and indirect elements is catered for.*
6.3	a.	Is there commitment to ongoing institutional capacity building and modernisation or renewal?	*Mechanisms need to be in place that ensure ongoing review and renewal in the face of new information and knowledge but institutions also need to actively seek learning and progress to ensure that the needs of stakeholders and users are met on an ongoing basis. The principles of social learning may be usefully employed (e.g. Pahl-Wostl, Sendzimir et al. 2007).*	States and Territories agree to incorporate the elements of the entitlements and allocation framework in this Agreement that are missing or deficient in existing water entitlement frameworks, into their legislative and administrative regimes (26 ii). Recognising that States and Territories retain the vested rights to the use, flow and control of water, they agree to modify their existing legislation and administrative regimes where necessary to ensure that their water access entitlement and planning frameworks incorporate the features identified in paragraphs 28-57 (27). Take all steps necessary, including making any corresponding legislative and administrative changes, to enable exchange rates and/or tagging of water access entitlements traded from interstate sources to buyers in their jurisdictions (63 i). Innovation and Capacity Building to Create Water Sensitive Australian Cities (92). Parties agree to (101): identify the key knowledge and capacity building priorities needed to support ongoing implementation of this Agreement (i); and identify and implement proposals to more effectively coordinate the national water knowledge effort (ii). The NWC provides advice on actions required to better realise the objectives and outcomes of the Agreement (Schedule C).	*There is commitment to institutional capacity building and adjustment to the requirements of the Agreement. Adjustments have to be carried out by 2006 but there is no mention if this is to be ongoing and it appears to be a one-off event. Institutional capacity building priorities are identified but it is unclear if this is ongoing or also a one-off occurrence. There should be a clear commitment to ongoing institutional capacity building and renewal at all levels.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	b.	Is institutional capacity building and modernisation or renewal done with keeping water in mind?	*All capacity building and renewal or updates should occur in a manner that emphasises water and its central role as well as all its relationships, hence the mechanisms mentioned under 6.3.1 should cater for water and ensure that it is considered.*	All institutional capacity building or update is done with regard to water (see 6.3.1a)	*Institutional capacity building and renewal should not only consider specific and obvious water issues but cater for the whole water system and all water values.*
6.4	a.	Is community capacity building enabled, supported and facilitated?	*Community capacity relates to informal or organised interactions of people and resources existing within a community that aid in problem solving, provide the basis to adapt to change and maintain wellbeing (Goodman, Speers et al. 1998; Chaskin 2006). It is also called community development and refers to local empowerment and the ability of communities to help themselves, which depends on strong social cohesion and low incidence of social problems as well as development of self esteem, confidence, self-reliance and decision-making power*	Knowledge and capacity building is a key element (24 vii) with specific needs specified in regional water accounts, changes in water availability, interaction between surface and groundwater, ecological outcomes from environmental flows, improvements in water use efficiency, catchment processes that impact on water quality and independent reviews of the knowledge base (98).	*While knowledge and capacity building are recognised as a key element, neither community capacity and community capacity building nor any of their elements are specifically mentioned in the agreement and this should be rectified.*
6.4.1	a.	*Community development* Is capacity for participation and leadership developed and fostered?			
	b.	Is skills development supported?			
	c.	Are resources provided (financial, social and technical) and is their prudent use ensured?			

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
	d.	Are social and inter-organisational networks fostered?	*(Department for Community Development 2005). Local initiatives need institutional and government support as well as resources, which include appropriate structures and processes (see also sections 2, 5, and 7) as well as those elements under 6.1-3 and 6.5. Social learning may also be useful in this context (e.g. Pahl-Wostl, Sendzimir et al. 2007). Water should be a central consideration in all these activities, highlighting the role of water in these and fostering (the awareness of) relationships with water.*		
	e.	Is the development of self-esteem, confidence, self-reliance and decision-making power supported?		
	f.	Is a sense of community promoted?		
	g.	Are all these efforts undertaken with water in mind or a focus on water?	See 6.4.	*Any community capacity building and development should have water as a focus to foster water literacy.*
6.5	a.	Are institutions able to deal with all forms of water?	*Institutions are often set up to deal with blue (liquid) water or waste water or sewage but have limited capacity to deal with green water, grey water (household waste water except toilet waste), black water (toilet waste),water vapour or virtual water (indirect water transfer through produce*	The Agreement only deals with surface and groundwater and does not make mention of rainwater, water vapour or soil water.	*The agreement should be broadened to include all forms of water (see 4.2) and the relevant institutions need to be enabled to deal with this.*

			Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				trade). This is true for formal[15] as well as informal institutions. The complexities of interconnectivities between these forms of water also need to be addressed as appropriate.		
7			**Transparency, Accessibility and Accountability**			
7.1	a.		Is information distributed freely within society?	*Information needs to be easily accessible and distributed actively throughout society, including to disadvantaged and less interested members. There need to be provisions and mechanisms for this to occur, e.g. good media exposure, distribution of written and other information, internet presence.*	How information is distributed is not clearly addressed in the Agreement, but some reference is made to information. Good information flow is envisaged for water markets (58i). Development of national guidelines for customers' water accounts that provide information on their water use relative to equivalent households in the community by 2006 (66 iv). The States and Territories will be required to report independently, publicly, and on an annual basis, benchmarking of pricing and service quality for metropolitan, non-metropolitan and rural water delivery agencies. (75) 89. The Parties agree to develop by mid 2005 and apply national guidelines by 2007 covering the application, scale, detail and frequency for open reporting addressing: i) metered water use and associated compliance and enforcement actions; ii) trade outcomes; iii) environmental water releases and management actions; and iv) availability	*It appears that there is provision for information to be made available and for reporting, however, it is unclear how most of this is to be made public, accessible or is being distributed and information needs to be provided on this.* *There is little reference to active distribution of information, which should be rectified.*

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[15] Formal institutions are those set up in a formalised way, such as government departments, educational institutions or banks. Informal institutions are those that are not formally organised such as culturally based interest groups, although some of these, such as religious organisations, may also be formalised.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
				of *water access entitlements* against the rules for availability and use.	
				93. Parties agree that the outcome is to engage water users and other stakeholders in achieving the objectives of this Agreement by: i) improving certainty and building confidence in reform processes; ii) transparency in decision making; and iii) ensuring sound information is available to all sectors at key decision points.	
				96. States and Territories agree to provide accurate and timely information to all relevant stakeholders regarding: i) progress with the implementation of *water plans*, including the achievement of objectives and likely future trends regarding the size of the consumptive pool; and ii) other issues relevant to the security of *water access entitlements* and the sustainability of water use, including the science underpinning the identification and implementation of *environmental and other public benefit outcomes*.	
				The Parties agree to work cooperatively with the NWC including through providing open access to relevant officers and timely provision of information necessary to assist the NWC in carrying out its role. The NWC will provide annual reports of its activities. All reports of the NWC will be publicly available. (Schedule C)	
				The Parties agree that water registers will be established in each State and Territory and will: 5. be publicly accessible, preferably over the internet, and include information such as the prices of trades and the identity of entitlement holders; (Schedule F)	
				The Parties agree that water trading rules will be established consistent with the principles below. 7. Where necessary, water authorities will facilitate trade by	

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				specifying trading zones and providing related information such as the exchange rates to be applied to trades in water allocations to: i) adjust for the effects of the transfer on hydrology or supply security (transmission losses) or reliability; and ii) reflect transfers between different classes of water sources, unregulated streams, regulated streams, supplemented streams, groundwater systems and licensed runoff harvesting dams. (Schedule G).	
	b.	Is this information accenting water?	*The tenet of* Water Centrality *should be supported by emphasising water and its relationships wherever possible to increase water literacy; it should become a matter of course.*	Much of the information to be provided according to the NWI is related to water but is restricted to specific issues.	*The information referred to in the NWI should be broadened so it does not only relate to specific issues but to the whole water system.*
7.1.1	a.	Are processes, institutions, methods data and information available and accessible to all?	*Institutions need to be contactable and accessible, in person and via phone and electronic means as well as with regard to structure and processes. The latter should be transparent, appropriate and uncomplicated. Data, information and methods need to be freely available to all interested parties. They need to be understandable and in a format that is accessible to all stakeholders and useful for decision makers (e.g. Dietz, Ostrom et al. 2003). It also means that*	Implementation plans are be made publicly available (9 iv). Water access entitlements and trades are publicly accessible (59). Annual public reporting on cost recovery for water planning and management (68). Annual independent and public reports will be prepared on benchmarking of pricing and service quality of water delivery agencies (75). Independent bodies are used (77) to set prices or review price setting processes for government service providers (i) and to publicly review and report on pricing in government and private water service providers (ii). Periodic independent audit, review and public reporting of the achievement of *environmental and other public benefit outcomes* and the adequacy of the water provision and management arrangements in achieving those outcomes (79 i d).	*As long as an interested person is literate and knows where to look information (especially on water entitlements) is accessible and available; although it is not clear how accessible data and methods are. With regard to understand-ability and format, no information is given but some form of general reference or guidelines should be provided.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			information needs to be available in different forms (e.g. print, radio, TV, and internet) since not everyone can read or has a TV, buys a newspaper or has internet access.	The Parties agree to develop by mid 2005 and apply national guidelines by 2007 covering the application, scale, detail and frequency for open reporting addressing (89): metered water use and associated compliance and enforcement actions (i); trade outcomes (ii); environmental water releases and management actions (iii); and availability of *water access entitlements* against the rules for availability and use (iv). States and Territories provide accurate and timely information to all relevant stakeholders regarding (96): progress with the implementation of water plans, including the achievement of objectives and likely future trends regarding the size of the consumptive pool (i); and other issues relevant to the security of water access entitlements and the sustainability of water use, including the science underpinning the identification and implementation of environmental and other public benefit outcomes (ii). NWC reports to COAG are publicly available (107 and Schedule C). *Water access entitlements* will (31) be recorded in publicly-accessible reliable water registers that foster public confidence and state unambiguously who owns the entitlement, and the nature of any encumbrances on it (paragraph 59 refers) (vii). Water registers will be publicly accessible, preferably over the internet, and include information such as the prices of trades and the identity of entitlement holders (Schedule F 5).	
7.1.2	a.	Are all processes and decisions transparent and open to public scrutiny?	*It needs to be obvious and apparent which processes are applied, how they work and how they are used. It also needs to be clear how*	9. The implementation plans will: (i) describe how the actions and timelines agreed in the IGA are to be achieved, including milestones for each key element of the Agreement (paragraph 24 refers); (ii) describe the timing and process for making any consequential changes to *water*	*Although a variety of processes are identified their outline is vague and does not indicate how open and transparent they are, bar from general reference to transparency.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			decisions are made and what the outcomes are. There need to be provisions for review and feedback (see also 5.1.3).	*plans* and the *water access entitlements* framework (paragraph 26 refers); (iii) be developed cooperatively between States and Territories which share water resources to ensure appropriate co-development of those actions which are of a cross-jurisdictional nature, including registries, trading rules, water products, and environmental outcomes; and (iv) be made publicly available. 25. The Parties agree that, once initiated, their *water access entitlements* and planning frameworks will: iii) be characterised by planning processes in which there is adequate opportunity for productive, environmental and other public benefit considerations to be identified and considered in an open and transparent way; v) implement firm pathways and open processes for returning previously over-allocated and/or overdrawn surface and groundwater systems to *environmentally-sustainable levels of extraction*; 26. The Parties agree that the general approach to implementing the entitlements and allocation framework will be to: iii) review any plans developed for the 1994 COAG framework to ensure that they now meet the requirements of this Agreement in terms of transparency of process, reporting arrangements and risk assignment; 38. The relevant State or Territory will determine whether a plan is prepared, what area it should cover, the level of detail required, its duration or frequency of review, and the amount of resources devoted to its preparation based on an assessment of the level of development of *water systems*, projected future consumptive demand and the risks of not having a detailed plan. 43. The Parties further agree that with respect to surface and groundwater resources not covered by the individual NCC endorsed implementation plans, and subject to	*This may be justified in those cases where a yet to be written document is referred to, although even then more detailed provisions to address these issues would be advantageous. Overall, some more clarity may be good but it remains to be seen how the processes actually operate in practice. An implementation review should be considered to provide such information (see also 5.1.1 & 5.1.2).* *With regard to planning processes, it should be clarified what is meant by 'open and transparent' (s.25iii and Schedule E, s.6iii).*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				paragraph 38, States and Territories will determine in accordance with the relevant *water plan*, the precise pathway by which any of those systems found to be *over-allocated* and/or *overused* as defined in the water planning process will be adjusted to address the over-allocation or overuse, and meet the *environmental and other public benefit outcomes*.	
				52. The Parties will provide for indigenous access to water resources, in accordance with relevant Commonwealth, State and Territory legislation, through planning processes that ensure: i) inclusion of indigenous representation in water planning wherever possible; and ii) *water plans* will incorporate indigenous social, spiritual and customary objectives and strategies for achieving these objectives wherever they can be developed.	
				53. Water planning processes will take account of the possible existence of native title rights to water in the catchment or aquifer area. The Parties note that plans may need to allocate water to native title holders following the recognition of native title rights in water under the Commonwealth *Native Title Act 1993*.	
				54. Water allocated to native title holders for traditional cultural purposes will be accounted for.	
				77. The Parties agree to use independent bodies to: i) set or review prices, or price setting processes, for water storage and delivery by government water service providers, on a case-by-case basis, consistent with the principles in paragraphs 65 to 68 above; and ii) publicly review and report on pricing in government and private water service providers to ensure that the principles in paragraphs 65 to 68 above are met.	

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				93. Parties agree that the outcome is to engage water users and other stakeholders in achieving the objectives of this Agreement by: i) improving certainty and building confidence in reform processes; ii) transparency in decision making; and iii) ensuring sound information is available to all sectors at key decision points.	
				Schedule D 1. The Parties agree that regulatory approvals enabling water use at a particular site for a particular purpose will: iv) clearly state the conditions relating to the approval, including the circumstances and processes relating to variations or terminations of the approval; vii) have transparent and contestable processes in place to establish whether a proposed activity is to be approved; and viii) have avenues for appealing approval decisions.	
				Schedule E: 4. In the case of ongoing plans, there should be a review process that allows for changes to be made in light of improved knowledge.	
				6. Water planning processes include: i) consultation with stakeholders including those within or downstream of the plan area; ii) the application of the best available scientific knowledge and, consistent with the level of knowledge and resource use, socio-economic analyses; iii) adequate opportunity for consumptive use, environmental, cultural, and other public benefit issues to be identified and considered in an open and transparent way; iv) reference to broader regional natural resource management planning processes; and v) consideration of, and synchronisation with, cross-jurisdictional water planning cycles.	
	b.	Do all processes and decisions take water into account?	*Water needs to be considered in all processes and in each decision; this may be in the*		*While many of the processes mentioned are related to water the context should be broadened to*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			form of an extra clause or set of questions or, ideally, should be built in or even focus on water.		*include all aspects of the water system and all water values.*
7.1.3	a.	Are all judgements, assumptions and uncertainties in data and interpretations being made explicit highlighting what this means for water?	*All judgements, assumptions and uncertainties need to be revealed to reduce surprises, hidden agendas and the potential for corruption. This needs to be considered with regard to 4.1- whole system review and should highlight the potential and actual effects on the water system.*	Full implementation of the NWI Agreement will achieve (25) transparent, statutory-based water planning (ii). There is commitment to openness and transparency in an open and transparent planning process (25 iii). 36. Recognising that settling the trade-offs between competing outcomes for water systems will involve judgements informed by best available science, socio-economic analysis and community input, statutory *water plans* will be prepared for surface water and groundwater management units in which entitlements are issued (subject to paragraph 38). Approval processes are to be transparent and contestable (Schedule D 1 vii). The knowledge base on which allocation and environmental requirements decisions are made needs to be specified (Schedule E 1 v). Also see assumptions that are made throughout the document, such as those pertaining to water markets and others.	*Some judgments, assumptions and uncertainties are recognised and provisions made for in some cases to account for these. Assumptions such as those relating to water markets are not made explicit as such; they are written as factual statements that do not refer to any underlying assumptions, such as the workability of markets, their failures and theory behind it all. The effects on the water system should be explored more broadly and include indirect effects. More clarity about underlying assumptions and interpretations should be provided beyond the definitions provided in Schedules B(i) and B(ii).*
7.2	a.	Are documents, processes and institutions designed to address the needs of the audience and users?	*Documents produced by and processes used in all institutions need to be understandable and user friendly. They also need to be relevant and appropriate to the audience, the process or institution in question. The*	In the implementation of *water plans*, the Parties will, consistent with the nature and intensity of resource use (40): provide regular public reports. The reporting will be designed to help water users and governments to manage risk, and be timed to give early indications of possible changes to the *consumptive pool* (iii). Parties agree to address significant adjustment issues affecting water users, in accordance with paragraph 97 (45).	*There is no direct reference to the user friendliness of the documents, processes and institutions or the needs of users, and such provisions should be added to the agreement or reference made to other relevant documents that may exist.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			institutions themselves need to be accessible and relevant, avoiding duplication or unnecessary complexity.	The Parties agree to address significant adjustment issues affecting *water access entitlement* holders and communities that may arise from reductions in water availability as a result of implementing the reforms proposed in this Agreement (97). States and Territories will consult with affected water users, communities and associated industry on possible appropriate responses to address these impacts, taking into account factors including (i): possible trade-offs between higher reliability and lower absolute amounts of water (a); the fact that water users have benefited from using the resource in the past (b); the scale of the changes sought and the speed with which they are to be implemented (including consideration of previous changes in water availability) (c); and the risk assignment framework referred to in paragraphs 46 to 51 (d). The agreement may be amended if all parties agree (102) and all parties will notify and consult each other with regard to matters that can improve the operation of the NWI (103).	*It may be useful to provide more generalised and overall guidance for a water society on matters of organisation, bureaucracy and administration, best worked out in a separate process, which can then be used as a reference in policy documents.*
	b.	Are documents, processes and institutions designed to address the needs of water?	*Documents and processes should be well thought-out, relating to and emphasising the roles and values of water. The institutions themselves should be designed with water in mind; conceptually, water could be used as a role model to set up processes and other elements, e.g. information flows and data pools; physically, buildings and settings should cater for water through appropriate setting, architecture,*	The NWI refers to water plans, water users, the consumptive and water access entitlements (see 7.2a)	*While the NWI refers only to elements of the water system, the water plans would hold more detailed information. However, it needs to be ensured that the whole water system and all water values are addressed and considered in these plans; the NWI should make provisions to ensure this. Guidance should also be given on the setup of institutions so that they are designed with water in mind in terms of processes, e.g. information flow and data pools, as well as their physical settings,*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			building methods and materials, interior design, infrastructure, etc.		*e.g. buildings and infrastructure. This may be usefully done in a separate process producing a document that can then be referred to in the NWI but also in other documents where appropriate.*
7.2.1	a.	Is the structure simple and is clear and plain language used that features water?	*The structure of documents and processes should be uncomplicated and unambiguous to enable ease of reading and use, for understanding without hidden meanings – flow and clarity. The language used must be plain and clear, using water metaphors where appropriate, with as little jargon as possible, for everyone to understand. Using water metaphors where appropriate enhances water awareness.*	The structure of the Agreement is not overly complex but since a table of contents is not provided this is not immediately clear. Generally the language is reasonably clear and plain although there is some jargon used. Schedules B(i) and B(ii) explain some of these terms.	*The Agreement could be set out much more clearly and its complexity could be reduced. A TOC would be very helpful and more explanations of terms used should be given. This document should be understandable to all Australians since it is an important national level document and everyone is required to take part in its implementation. There is little 'water language' used in the document, which should be rectified to enhance its appeal and 'wateriness' and contribute to the metaphor.*
7.3	a.	Are government, private sector and civil society organisations accountable to the public and the interests they represent including the water system?	*Some form of public review or accountability process should be in place (e.g. such bodies as the Auditor General, the Ombudsman or the Senate Estimates Committee could be utilised/adapted) to ensure that organisations actually deliver what they are*	Review processes are in place (see 5.2.a). Environmental water managers are accountable for the management of environmental water provisions and the achievement of *environmental and other public benefit outcomes* (79 i a).	*There are review processes and some accountability assignment in place; however, there should be more detail on this, particularly regarding the public interest and the water system, also with regard to consequences in case of breaches or misconduct.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			supposed to and that the possibility for corruption is minimised. Such system should have a focus on water in all its forms, ensuring that the water system is represented and considered always.		
7.4	a.	Are responsibilities assigned clearly with accent on water?	*Responsibilities need to be allocated to the organisation(s), person(s) or institution(s) that can best deal with particular elements of the water system so that good outcomes are ensured. All roles need to be well defined and supported (see 6.3) and need to include conflict management and resolution mechanisms (see e.g. Dietz, Ostrom et al. 2003).*	Responsibilities are assigned to the States and Territories, the Commonwealth Government, the Natural Resource Management Ministerial Council (NRMMC) and the National Water Commission (NWC) (18-22 and throughout the document). Water access entitlements will indicate clearly the responsibilities and obligations of the entitlement holder consistent with the water plan relevant to the source of water (32 i). Establishing and equipping accountable environmental water managers with the necessary authority and resources to provide sufficient water at the right times and places to achieve the environmental and public benefit outcomes (78 ii).	*Institutional responsibilities are assigned with regard to processes and administration but there are some unclear areas with regard to policing and non-compliance and how it all relates to the water system. Also, the responsibilities of the community and individuals with regard to water should be made clearer.*

Appendix C

Full *Water Centrality* Instrument Application to the

Western Australian *Environmental Water Provisions Policy* (Water and Rivers Commission 2000)

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
1		**Strategic Vision**			
1.1	a.	Is there a clear, broad and long-term vision?	*The vision is a statement of the overall aim. A succinct formulation should capture in easy to understand and broad terms what is to be achieved in the long run. It should inspire by being sensible and credible, sound and well-reasoned as well as emotionally appealing and vividly presented.*	The primary objective (s.2.2) can be considered as the equivalent of a vision. It is quite clear in its aim to protect water dependent ecosystems while allowing for long-term sustainable use and development of water resources.	*The primary objective does not refer to the whole water system, only to a component and needs to be put into the whole water system context. It also should be reformulated into a vision, and colour and emotional appeal should be added.*
	b.	Does this vision reflect the centrality of water for life?	*The central role of water is taken into account and acknowledged in the vision. The centrality of water refers to its absolute importance for life and overall system function.*	No, since it is specifically aimed at the protection of water dependent ecosystems (WDE), defined as "those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence of water resources, including flowing or standing water and water within groundwater aquifers" (Water and Rivers Commission 2000 p. 12).	*The vision needs to be broadened considerably to reflect the importance of water for life, since it so far only refers to WDE, although the definition could be interpreted as referring to all life since all of it depends on 'the permanent or temporary presence of water resources' (p.12).*
	c.	Is the vision defined by goals or objectives that also	*The goals define the vision in a more tangible and detailed way and show the importance*	The Commission's guiding principles (s.2.4) could be seen as the goals for this policy. However, these principles do not reflect the centrality of water for life; they are very	*The guiding principles (=goals) need to be broadened as well, so that they reflect the centrality of*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		reflect the centrality of water for life?	*and centrality of water, i.e. the connection water has with all aspects of life.*	much focussed on WDE only.	*water for life. They also need to include other ecosystems and values besides those pertaining to WDE and their ecological values.*
1.2	a.	Are ethical principles made explicit that may be represented by traditional water rights, human rights and indigenous lore of relevant societies?	*Ethical principles such as those represented by human rights, including the right to water, should be ensured. Traditional water rights may be taken into consideration if they represent ethical principles. Traditions and lore may need to be reviewed for their ethicality, e.g. inequitable distribution of water may not be acceptable even if it is a traditional right. This would best be embedded in a* Water Centrality *Charter.*	There is no explicit reference to ethical principles in the policy. However, the policy is tied to ESD and other legislation that may take theses principles into consideration (s.2.3). Although reference is made to traditional Aboriginal heritage values (Appendix 3, p.16) they are not considered in terms of ethics.	*Explicit reference to ethical principles should be provided. This could be achieved more easily if a* Water Centrality *Charter were adopted that is based on ethical principles.*
1.3	a.	Is broad consensus aimed for with regard to the best interest of the group and, where possible, policies and procedures to benefit the water system?	*Broad consensus[16] is more than a majority rule or decision; it means to achieve broad agreement, a common base through negotiation and conflict management to ensure acceptance of outcomes and enable implementation. This requires participation of all*	Community involvement is an important consideration in the policy (s.2.4 [7,9,14-16] s.3.3, Appendix 3, p.16), however, there is no direct reference to broad consensus. Consensus may be inferred since there was little dissent in submissions to the draft, however, 33 submissions do not represent the majority of the community and it is unclear how far and well the draft policy was distributed.	*It is unclear if the policy is based on broad consent and who was involved in producing the document; 33 submissions that were received in the consultation phase indicate some dissent but also that feedback was sought, although it is unclear if this was a result of broad participation (see*

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[16] The WCI is an organising tool that by itself cannot achieve consensus; conflict management, not conflict resolution, should be used to harness the creative potential of conflict and tension Dietz, T., E. Ostrom, et al. (2003). The struggle to govern the commons. *Science* **302**(5652): 1907-1912. and reach a common accord or basis from which to proceed that does not imply uniform opinions or total agreement

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			relevant stakeholders and decision makers (see also 2.1) and aims for the 'wellbeing' of the water system.		*2). Clarification of these issues should be provided.*
2		**Participation and Voice**			
2.1	a.	Are affected and interested parties, including non-human interests and water, represented and do they have a voice throughout processes of policy and decision making?	*It is not sufficient to state that all relevant stakeholders are included. Explicit listing of stakeholders (including women, youth, indigenous people and non-human life forms) would be useful in most cases. Representation of non-human life forms as well as water should be ensured through advocacy.*	The provisions to obtain input from stakeholders and the public are outlined (s.2.4 [7,9,14-16] s.3.3, Appendix 3, p.16) and deemed fundamental to the policy, however, much of this input is based on statutory requirements (as public submissions) while provisions are being made for additional stakeholder input (in most cases) (s.3.3 p.10). Details of how this is done are given but limited. Stakeholders are not described, except for indigenous people who will be involved in identifying indigenous heritage values. Youth and women are not explicitly mentioned and may not be involved if they are not identified as stakeholders.	*It would be useful to clarify the extent and nature of public involvement. Reference to a public participation policy (if this exists) would be useful. More explicit description of potential stakeholder groups and how their involvement is ensured would be advantageous. Specific, and traditionally disadvantaged or disregarded groups, such as women and youth, as well as non-human life forms should be explicitly mentioned so they do not get neglected or overlooked.*
	b.	Is recognition of diverse and changing values ensured through this?	*Consideration of all values should be ensured through appropriate processes (see also 2.1.1.b). Changes over time need to be dealt with on an ongoing basis (see also 5).*	The policy mentions that there may be conflicting values and also changes in values over time that need to be taken into consideration. Regular review of allocations and EWP is envisaged to take into consideration changing community values (s.2.4[15]). There is no clear indication of how this is to be done.	*There is recognition of diverse and changing values, which will be addressed through review of water allocations and EWP, but some more detail on how the review process ensures that changing values are considered would be helpful.*
2.1.1	a.	Are freedom of association and	*These are basic human rights without which full*	There is no specific mention of this in the policy, however, since Australia is a signatory to the UDHR and the ICCPR	*The EWP policy does not make any reference to Human Rights,*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		speech assured?	*participation cannot occur. The UDHR[17] affirms the right to free speech so does the ICCPR[18]. Australia is a signatory to both but has not enshrined free speech into legislation and hence it is not enforceable in court, while freedom of association was mainly granted with regard to unions in Australia. The situation may require attention since these rights are not automatically ensured and should be officially enshrined in some form as well as being enforced.* *Arguably, a form of participative democracy would best suit* Water Centrality *to enable fuller participation overall.*	it is hoped that the right to free speech and association is upheld even so it is not enforceable in court.	*including freedom of association and speech. It is unclear what the exact situation is in Australia since the Convention of Human Rights has not been translated into law. This may need to be addressed in a different forum.*
	b.	Are capacities to participate constructively ensured?	*Constructive participation is based on accessibility, openness and fairness (see also 5 and 6) but also should*	The policy does not talk about capacity to participate aside from the ways in which community input is achieved (s.3.3). There is no mention of capacity building in that respect or of tailoring any participatory activity to the	*The mention of a selection of participatory methods is not sufficient without reference to this being tailored to those people's*

[17] Universal Declaration of Human Rights (UDHR), Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

[18] Article 19(2) of the United Nations International Covenant on Civil and Political Rights (ICCPR) (1966) states that: Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice. The ICCPR forms Schedule 2 of the Human Rights and Equal Opportunity Commission Act 1986 (Commonwealth).

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			ensure that participatory processes are tailored to the participants so they are not disadvantaged because of gender, ethnicity, age, economic or literacy status or other potential impediments (see also 7).	participants although a range of different tools (e.g. meetings, forums and committees) are mentioned (s.3.3, p.10).	*needs and the provision of training if necessary.*
2.1.2	a.	Is the participation of decision makers ensured to secure a firm link to adopted policies and resulting action that benefit water?	*Decision makers are stakeholders who need to be included from the start, preferably in the planning stages, so that coherency and implementation are ensured to the benefit of water.*	Yes, the policy is written for decision makers (and the public) and the commission is clearly identified as the decision making authority and is instrumental in adopting and implementing the policy (page i.). However, since the policy is a statement of intent there is no guarantee given that implementation will occur beyond statutory requirements.	*Participation of decision makers should be ensured through the policy, assuming that implementation is occurring as stated.*
3		**Equity and Fairness**			
3.1	a.	Are the ecological conditions and the central role of water on which life depends considered for equity amongst all life forms?	*Changes in ecological conditions can have far-reaching consequences and need to be identified so they can be addressed. In this, all life forms, including humans, need to be treated equitably due to interdependence.*	The intension of the policy is to maintain essential natural ecological processes and biodiversity of WDE in water resource planning and management processes and decision making (s.2.4). If the required EWR cannot be met the risks to ecosystems are identified alongside the social and economic costs for meeting the EWRs and the community is consulted and the strategy submitted to the EPA (s.2.4 [7]). Equity with regard to ecological conditions is not mentioned and it is unclear if and how it is considered.	*Equity with regard to ecological conditions for life should be considered in the policy while the scope of the policy should be broadened (see also 1.1.a-c).The major shortfall is the restriction to WDE, while the process seems adequate (at least within the present accepted context; there are issues with the adequacy of the EIA process that need to be tackled elsewhere).*
	b.	Is the central role of water for those ecological conditions considered?	*Without water there is no life, so water availability is central to all ecosystems and life forms as well as their*	It is considered for WDE, which directly depend on blue water (Glossary, p.12).	*The central role for water for ecological conditions is not mentioned, only for WDE. Hence, the policy needs to be broadened*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			functions. This should be acknowledged clearly.		*to include indirect water dependencies, other parts of the water cycle and ecosystem services (see 3.1.a)*
3.1.1	a.	Do all groups in society as well as non-human life forms have adequate access to water to ensure opportunities to improve their wellbeing?	*Adequate access to water is the basis for existence and wellbeing for all life forms, human and non-human. Hence, existing ecosystems and human populations need to have at minimum sufficient water for survival. Humans are part of the ecosystem and rely on healthy ecosystem function hence this function needs to be ensured while human needs also have to be covered beyond mere survival (see Chapter 2). Decisions should be based on information and knowledge and human influences have to be balanced accordingly.*	The policy focuses WDE and human water needs as well as those of other life forms are only considered in that context. There are provisions to change consumptive allocations through a public planning review process outside of the policy (s.2.4[10], s.3.2, p.8)). Water management has to be sustainable according to the Act19 and is also referred to in the primary objective (s.2.2). The policy reconfirms the sustainability principles of the NSESD 1992 (s.2.3). ESD is considered in Sub-regional Management Plans and Local Area Management Plans, which are not outlined in detail in the policy (s.3.1, p.6).	*Opportunity to improve wellbeing is not part of the policy except for water dependent ecosystems. As mentioned previously, it may be useful to either broaden the scope of the policy (see 1.1) or tie it in with a broader framework that takes care of these aspects.*

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19 *Rights in Water and Irrigation Act 1914* (the Act)

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
3.1.2	a.	Are intra- and inter-generational equity and disparity considered in terms of resource use and access, water quality, pollution, poverty, over-consumption, human rights and access to services?	*Equity is essential for Water Centrality. All people should have equal rights and obligations as well as equal opportunity to the listed issues, as a minimum[20]. The needs of future generations must be considered as well as the needs of the people currently alive. Considerations need to include equity between regions, e.g. in inter-basin water transfers.*	Yes, the policy refers to "the needs of current and future users" in its primary objective as well as to the core objectives of the National Strategy for Ecologically Sustainable Development (1992). It considers water resource use and over-consumption as well as some water access issues with regard to WDE.	*Poverty, human rights and access to services are not part of the policy directly, although they may be implied in certain elements, such as access to stock water; however more explicit reference to these aspects would be useful, see 3.1.1.a.*
	b.	Are these considerations in 3.1.2.a related to water?	*Water is essential to or interacts with most of these considerations (see 3.1.2.a) and hence these relationships need to be explored appropriately.*	See 3.1.2.a. limited WDE focus…	*See 3.1.2.a. None of these considerations, either directly or through reference are related to water, but this is necessary for a water central water policy.*
4		**Integration and Coherency**			
4.1	a.	Is there a review of the whole system as well as its parts?	*A review of an entire system may be difficult and complex, depending on the system in question, but has to take place at some stage (rather sooner than later). Systems can be encapsulated within other*	The whole system in this case would be the water system, which is not reviewed in its entirety. The policy focuses on WDE and rather than exploring their relationships with the whole water system, the legal and policy contexts are outlined. The policy does refer to a holistic approach with regard to the determination of EWRs and EWPs as used by	*The whole system is not reviewed nor is reference made to a review that has taken place elsewhere. → a review of the whole water system should be conducted for WA, or even better for the whole of Australia, so that not only this*

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[20] Rawls (1971) argued that if there is to be liberty of opportunity, then opportunity must exist for all in every institution. If water doctrines do not promote equality of liberty of opportunity in access to water, then the liberties of the whole society are reduced. Tisdell, J. G. (2003). Equity and social justice in water doctrines. *Social Justice Research* **16**(4): 401-416.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			systems and different scales may need to be considered depending on the situation. It would be useful to do a review of the whole water system and all water cycles showing interconnections as well as direct and indirect effects, so that this can be referred to in reviews of lower scale systems and used to place these systems into context (in a nested approach) since a subsystem cannot stand alone. A conceptual model of the system in question showing all the connections to water should be produced. Such a review requires a participatory approach, such as mapping exercises and others. Methodologies such as input-output analysis of water use (Lenzen and Foran 2001) may be useful. The values of water (Chapter 2) may be a starting point and rough guide.	Arthington et al. (1992) which includes economic and social considerations (s.3.2), but it is unclear to what extent this is applied.	*policy but other policies, processes, legislation and decisions in general have a base for referral. This needs to be done only once and can then be used where appropriate. Review of the whole water system review will have to be ongoing as new knowledge comes to light.*
	b.	Is the central role of water being made explicit in the system and its parts?	*This is paramount since water is the source of life. It includes direct as well as indirect roles of water. The whole water system review should serve to make the central role of water*	For the WDE the central role of water is acknowledged but not for the whole water system or other subsystems.	*The existing reference to the central role of water for WDE may be sufficient if the whole system context were established by reference to the whole water system review (see 2.1.a).*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			explicit, with quantitative as well as qualitative aspects (values of water, input-output analysis (e.g. Lenzen and Foran 2001)).		
	c.	Are the implications and potential impacts for all water cycles considered?	*These include the local, regional and global water cycles as well as those above ground and underground in liquid, vapour and solid (ice) form, taking into consideration living and non-living elements. The virtual water cycle may also need to be considered.*	The impacts on water cycles are considered mainly in a localised context and only for the liquid water component, i.e. flows in rivers, water in wetlands or groundwater levels (s.3.2, p.7) (as opposed to rainfall, evapotranspiration, soil water, water storage in ecosystems, etc). Some regional considerations may be included through water plans (s.3.1); no global context is considered.	*The implications need to be broadened from the primarily localised context and the focus on mainly blue water to include other water cycles including vapour, soil water and global elements.*
	d.	Are the connections and interdependencies of water considered?	*Since water is central to life its connections and interdependencies need to be explored fully.* *The review of the water system should show this. A form of input-output analysis may be useful.*	The interdependencies of water are only considered with regard to WDE. Although some social and economic aspects are considered as well as existing environmental changes (s.2.4, s.3.2), wider ecological interconnections are not explored.	*The existing reference to some social, economic and environmental aspects with regard to WDE only is insufficient. Provision should be made for wider exploration of interdependencies and connections of water to include those of indirect dependencies and ecosystem services.*
	e.	Is sufficient knowledge available about the system and its parts? If not, are provisions made to address this?	*This has to be determined on a case by case basis.* *If insufficient knowledge is available efforts should be made to remedy this (see also 6.3, 6.7, 7.3 and 7.4).* *In the meantime the precautionary principle should*	It is acknowledged that often limited knowledge is available about WDE. In such cases the policy makes provision to apply the precautionary principle. It also supports research to improve the knowledge base (s.2.4). There is no mention about the state of knowledge about the whole system but given the state of knowledge about WDE it is obvious that knowledge gaps do exist in the whole water system as well	*It appears that provisions for knowledge improvement with regard to WDE are addressed sufficiently, but whole water system aspects need to be improved and could be addressed in association with a review of the whole water system (see 2.1.a).*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			be adopted. Review and update regularly.		
4.1.1	a.	Is the wellbeing, its state as well as the direction and rate of change, of the ecological subsystem and its component parts considered with regard to water?	The ecological subsystem* comprises all living things and the cycles they rely on as well as the role water plays in these. Although humans are part of this subsystem they are considered separately in the social subsystem (4.1.1.b) due to the extensive influence we have on the water system. *It seems useful to explore the subsystems separately and in detail to facilitate better understanding, but it is important to take note of any interconnections with other subsystems so they can be taken into account (in 4.1.1.d). Trends need to be identified in order to anticipate change and prioritise actions. It may be useful to have a generic conceptual model of the system in question to guide exploration (the review of 4.1 could be a useful guide).	Yes, the state of the ecological subsystem as well as its components with regard to water is considered in the policy, but only for WDE. Other ecological components are not considered. The direction and rate of change of the ecological subsystem and its parts are also considered for WDE only, mainly through the provision to review water plans regularly to reflect changes and new information (s.2.4).	Broader consideration of the wellbeing and change components of the ecological system other than WDE is needed, e.g. those that depend on water indirectly.
	b.	Is the wellbeing, its state as well as the direction and rate of change, of the social	The social subsystem refers to human endeavours, activities and institutions and the cycles they rely on as well as those	Yes, the social subsystem is included, but only with regard to certain social values, such as Aboriginal and other Australian heritage, recreational and tourism activities, landscape and aesthetic features, and educational and	Broader coverage of social issues is needed and should include indirect uses (see Chapter 2). Since social aspects are so

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		subsystem and its component parts considered with regard to water?	*that depend on human interaction (see also Chapter 2).* *Those concerns directly to do with physical survival are not strictly social but are included for the sake of simplicity. (See also* at 4.1.1)*	scientific considerations. Small-scale domestic and stock water use may also be included here. It is clearly stated that social values are not the primary consideration and that important social values associated with water supply, industrial and irrigation use as well as power generation are not included in the social subsystem but in the economic (Appendix 3, s.1). The direction and rate of change of the social subsystem is considered insofar as it is acknowledged that water plans will be reviewed regularly or as needed to reflect changes in conditions (throughout document).	*interconnected with the water system they should be included as a matter of course in all decisions to ensure* Water Centrality *outcomes. This should be reflected in the policy.*
	c.	Is the wellbeing, its state as well as the direction and rate of change, of the economic subsystem and its component parts considered with regard to water?	*The economic subsystem is arguably a subsystem of the social (or human) system but since economics appears to be of great importance to humans it is dealt with separately. This subsystem relates to the production, distribution and trade of goods and wealth and needs to be related to water. (See * at 4.1.1)*	The economic subsystem, referred to as 'consumptive water use' throughout the document, is included in the policy mainly implicitly and is not described in detail. It is included in decision making and in setting the management objectives for the system that is assessed in conjunction with the EWR and SWR that have been determined. Although economic values are a consideration in setting EWPs (s.2.4) they do not seem to form an integral part of the EWP policy. The policy refers to commercial and economic uses, such as public and industrial water supply, irrigation and hydroelectric power generation, but only acknowledges that they also have a social value and refers to the normal allocation licensing processes through which they are managed (Appendix 3 s.1).	*The economic subsystem is neglected in the policy and needs to be included explicitly and in more detail since it has such a large effect on water allocation.*
	d.	Are the wellbeing, the state as well as the direction and rate of change, of the interactions of the subsystems and their component parts	*All three subsystems interact and therefore it is an important if complex (and often neglected) task to fully explore the interactions of all subsystems to detect trends, opportunities and threats that*	Some interactions between the ecological and social subsystems are explored, whereas interactions with the economic subsystem are somewhat unclear. The economic subsystem is included in decisions for EWP (s. 2.4 & s.3.2), although it is not obvious how this is done.	*The part of the policy that refers to interactions of the subsystems needs clarification especially with regard to how economic aspects are included in decision making. Provisions also need to be made for a much broader exploration of*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		being considered with regard to water?	*arise from these interactions.*		*interactions between all three subsystems to identify arising trends, opportunities and threats.*
4.1.2	a.	Are the positive and negative outcomes of human activities identified as monetary and non-monetary values of water (= ecosystem services of water), so that the costs and benefits to human and ecological systems are reflected?	*In all three subsystems both monetary and non-monetary values exist (are assigned by humans). All of them are important for a fuller picture of the outcomes of human activities, positive and negative, for both humans and ecological systems (since without functioning ecosystems human endeavours are impossible).*	Some non-monetary values of water are included in the policy as part of the ecological and social components but many others are not considered. Monetary values are only included to a limited extent as part of the social values (but this is not made explicit). Monetary values associated with ecosystem services or economic uses are not part of the policy.	*A much clearer and more complete outline of both monetary and non-monetary values of water is needed to provide a fuller picture of the existing situation.*
4.1.3	a.	Are the ecosystem services of water fully considered?	*This needs to be done with regard to direct and indirect ecosystem services such as regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment 2005). All these services depend on water or are connected to it (see also Chapter 3.2).*	The policy is aligned with the National Principles for the Provision of Water for Ecosystems (1996) which aims at sustaining and restoring processes and biodiversity of WDE. More generally, the policy must meet core objectives of the NSESD (1992) which include the protection of biodiversity and the maintenance of "essential ecological processes and life support systems" (Water and Rivers Commission 2000 p. 3), however, it does this only with regard to WDE and water resources (rivers, wetlands and groundwater areas).	*The policy should include indirect ecosystem services more fully to be better aligned with the NSESD (1992) and should show the central role that water plays in all of them.*
	b.	Are the economic activities that	*This is a more detailed look at the monetary values, as well as*	Yes, but they are not outlined explicitly. 'Consumptive uses' are referred to throughout the policy but there is no	*Economic activities and consumptive uses of water need to*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		contribute to human/social wellbeing considered with regard to water?	*trade and commerce activities related to water in terms of their contribution to human wellbeing (could be part of 4.2.1.c and 4.2.3.b).*	guidance on how they are to be included or assessed. Other economic activities, such as those related to tourism and recreation, are not included explicitly, but could be included in the social allocations (s.3.2).	*be treated more explicitly and their contribution to human wellbeing needs to be outlined in detail.*
	c.	Are the non-market activities that contribute to human/ social wellbeing considered with regard to water?	*A more detailed look at non-monetary values that contribute to human wellbeing and their relationship with water (could be part of 4.2.1.b, 4.2.2.a and 4.2.3.b).*	Some of them are included (s.3.2) (see also 2.2.b), but many, including most indirect values and activities, are not considered.	*Reference to non-market activities need to be broadened considerably, especially with regard to the more indirect uses of water that contribute to human wellbeing, such as those relating to physical and mental health and spirituality.*
	d.	Are the interactions of the ecosystem services of water as well as their economic and non-market values considered?	*The interactions of the ecosystem services outlined in 4.2.3.a-c can oppose or negate each other and should be fully explored to anticipate or prevent serious implications for human and ecosystem wellbeing.*	To a limited extent, only as assessed and considered in the EWP decision (s.3.2).	*The interactions of ecosystem services and economic and non-economic values of water (see 4.2.3.a-c) are considered only to a very limited extent and should be broadened considerably to allow for better consideration of interactions and their effects in planning and management.*
	e.	Are all these elements considered in a local, regional, national and global context?	*All these elements (4.2.3.a to 4.2.3.d) need to be considered with regard to these levels to ascertain their influences and extent and how they are best approached or solved. These contexts may overlap or be discrete but it is likely that more than one level will apply and cross-scale influences will*	The policy refers to ecological values at a sub-regional, regional and management area level and supports water allocation/management plans at local area, sub-regional and regional levels as outlined in the RIWI Act (s.3.1). According to the policy it is preferable that EWP be set in a catchment (whole river basin) or groundwater flow area context, although it also recognises that this is impossible in many cases. The spatial context of other elements is not given. The national context is only regarded in cases where	*All elements (4.2.3.a-d), also the social and economic aspects, should ideally be considered at all spatial levels (local to global), or at least provisions made to allow for this to occur, to ascertain if all levels are needed or affected and to what extent.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			need to be considered (see e.g. Dietz, Ostrom et al. 2003).	national legislation or policy is triggered. A global context is not referred to.	
4.1.4	a.	Are the time frames long enough to capture all water system (hydrological cycle) time scales?	*This depends on the water system(s) that are affected and varies with the nature of the assessed item and the spatial scale. However, all water systems and cycles are interdependent, which needs to be realised and acknowledged. Since it is not practical to do a full assessment of all water cycles in all systems in all cases, a full inventory of water cycles and their interactions should be available elsewhere for reference.*	Firstly, the policy is in place for 5 years before a decision on a review is made (s.2.1). This timeframe is administrative and independent from water cycles. Secondly, there is a requirement to meet the needs of future generations (s.2.3), however, is it not specified how this is to be achieved or what time-frames this entails or how many generations. Obviously, this anthropocentric timeframe refers to decades, which does not necessarily concur with hydrological cycles, although many water cycles are shorter than a human life time and it is reasonable to assume that most relevant water cycles would be covered.	*Timeframes are set to deal with implementation and administration but have little to do with water cycles. Better exploration of all water cycles and their associated time frames is needed which should be reflected in the policy as well as in water plans.*
	b.	Are time scales appropriate to cater for future generations?	*This implies multiples of a human generation length (~25yrs).*	This is the intention of the policy; however, the timeframe is not specified. Those references to timeframes in the document are short-term (5-7 years; see 4.2.4).	*Although references are made to future generations (s.2.3) and also sustainability, which is referred to throughout the document, a more specific outline of timeframes would be useful with regard to planning.*
	c.	Are time scales appropriate for current short-term decision making?	*Should be suitable for the case in question and may include election or review cycles.*	This appears to be the case since time scales concur with the usual administrative cycles (see also 4.2.4.a&b). Time frames are given for review of policies, water allocations and plans (5 or 7 yrs) but changes can be made any time in case new information is obtained (at least for EWPs) (s.3.2).	*The time scales of 5 and 7 years mentioned in the document seem to be appropriate to short-term decision making, and changes in conditions may also be dealt with at any time.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
4.1.5	a.	Is the spatial frame of reference sufficiently large to include both local and long distance impacts on water systems?	*Long distance and cross-scale influences (atmospheric, groundwater, rivers) can have great importance on local conditions and* vice versa. *Even if the assessment is for a small area the broader picture needs to be captured so that these influences can be ascertained (see also 4.2.3e).*	The policy does cater for local, sub-regional, regional area levels (s. 3.1), which does not appear to include very long distances, although this depends on the size of a river basin or groundwater flow area.	*Long-distance influences will need some greater consideration since the policy does include local to regional scales but does not even set a state-wide scale, let alone national or global considerations. This need to be remedied so that long-distance and cross-scale effects can be ascertained and addressed.*
4.1.6	a.	Are historic considerations included in anticipating future conditions of water?	*Includes traditional, cultural, ecological, spiritual, legal, commercial, political and administrative heritage and their relationships to water. Their influence may be past or ongoing but all need to be considered for potential effect of the future of water systems.*	Yes, as part of the determination of SWR, expressed as "Aboriginal and other Australian heritage" values (p.16). These are not specified in any more detail.	*A clearer explanation of what types of heritage are to be included in EWP assessments would be useful. Ideally, the full range of heritage types (see 'Expectations') should be included for a thorough treatment of issues.*
	b.	Are current conditions of water systems considered in anticipating future conditions?	*The current state of the water system, in terms of water availability, quality, hydrogeology, ecology as well as allocation status, can determine future outcomes and needs to be documented and assessed, also as a reference point.*	Yes, at least with regard to WDE.	*The current conditions of the water system may have to be broadened to include other considerations besides those relevant to WDE (see 1.1 a-c).*
	c.	Where could we go? Are all possibilities and alternatives considered?	*All scenarios and possibilities, including the 'no change' option and utopian ones, can be informative and inspiring*	The policy is not explicit in this regard. However, through various public and stakeholder consultation opportunities different options may be explored, but this is not prescribed.	*It is unclear to what extent alternatives and different possibilities are explored, e.g. in water plans, allocation decisions*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			and need to be explored to ensure that fully informed decisions are made.		*or the EWP process. Provisions should be made for the exploration of all options to allow for better informed decisions.*
4.1.7	a.	Is an explicit set of categories or an organising framework employed that links vision and goals to indicators and assessment criteria?	*A clear framework can help with identifying meaningful indicators and aid assessment (e.g. Peet and Bossel 2000); this needs to be linked to the vision and goals to ensure that intended outcomes are achieved. Review framework and indicators regularly for appropriateness.*	Not sure. They refer to Arthington et al (1992) for a holistic approach to determining EWR (s.3.2). This applies to environmental stream flows and is based on an expert model rather than indicators. It takes economic and social aspects into consideration when evaluating options, however, no indicators are mentioned with regard to social and economic values.	*It is unclear how the proposed holistic approach is linked to the vision and goals and if it is a suitable framework to link indicators and assessment criteria to the vision. This should be made explicit. It may be useful to provide a separate section or document on this for use in water plans that include the considerations in 4.2.7.1 to 4.2.7.4.*
	b.	Do the set of categories or the organising framework have water as a central concern and are the indicators and assessment criteria related to the water system?	*The framework has to ensure that water is made a central concern and the indicators or the assessment criteria need to be chosen accordingly. While this would include obviously water-related elements, given that water is relevant for most aspects of interest to humans, at least indirectly, many 'non-water' aspects could also be valid.*	See 4.1.7a. The holistic approach use by Arthington et al. (1992) relates only to streams.	*The holistic approach proposed only refers to in stream flows and should be broadened to be useful for the whole water system.*
4.1.7.1	a.	Are a limited number of key issues used for analysis?	*A limited number of key issues help reduce complexity. Ensure that key issues are correct and applicable through an inclusive participatory*	Yes, the only issues considered in the EWPs (s.2.4.and s.3.2) are key ecological values and social values if appropriate.	*A limited number of key issues are used for analysis of ecological and social values; if anything, more key issues are needed to broaden the scope, especially with regard*

			Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				process.		*to economic aspects.*
		b.	Are these key issues related to water and *Water Centrality?*	*While most issues are related to water, at least indirectly, those that have the most obvious and relevant connections to the Water Centrality Principles should be chosen.*	Yes, key issues are taken from ecological and social values of water.	*Key issues relate to water but would need to be broadened to cover other relevant areas of the water system besides social and ecological values.*
4.1.7.2		a.	Are a limited number of indicators or indicator combinations used that provide a clear sign of progress towards *Water Centrality?*	*Fewer indicators limit complexity, but they need to be relevant to what is assessed, in this case progress towards* Water Centrality. *A policy may not need to be descriptive in detail but should ensure guidance if subsequent processes or documents need to deal with this.*	This is not mentioned, although these could be included in the water resource management plans.	*Indicators are not mentioned in the policy, and although details may not be necessary at the policy level broad guidance should be provided for use of indicators in water resource management plans (see also 4.2.8), so that progress towards* Water Centrality *can be assessed.*
4.1.7.3		a.	Are measurements standardised wherever possible to allow comparison?	*Standardisation is usually not a problem for quantifiable measurements but can be more difficult for some qualitative data. Comparison is important for monitoring progress and trends.*	Not mentioned, but presumably so, since the commission is responsible for decision making and water plans have to follow a certain format. Presumably, some standard measurements are normally used.	*For the sake of clarity it may be useful to specify relevant standard measurements for use in plans for ease of comparison.*
		b.	Do these measurements relate to water?	*Although most measurements can be related to water, at least indirectly, the most*	See 4.1.7.3a.	*Such measurements should be relevant to the aspect of the water system under consideration.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			appropriate and relevant should be chosen.		
4.1.7.4	a.	Are indicator values compared to targets, reference values, ranges, thresholds or directions of trends, as appropriate?	*Comparison is paramount to assess progress and trends. Indicators can be quantitative or qualitative and include not only bio-physical and socio-economic but also political measures, e.g. policy and legislation. Performance targets should be complemented by information targets[21] to allow for ongoing evaluation and course corrections.*	Not referred to.	*Some guidance should be provided on comparing indicator values to targets for consideration in water and allocation plans.*
	b.	Do these values relate to the water system?	*Indicator values as well as target values should be related to the water system as explicitly as possible.*	Not referred to.	*Target values should be chosen to be relevant for the part of the water system to be assessed.*
4.1.8	a.	Is information drawn from indicators and other tools that are stimulating and serve to engage decision-makers?	*Meaningful and relevant information is best, but may not be readily available and an ongoing search for information and knowledge is needed (see 5.2.1). Decision makers need to be interested to ensure ongoing involvement, commitment and appropriate decisions.*	Decision makers are clearly engaged since they have to make the allocation decisions in the end. However, indicators are not mentioned and it may not be the role of a policy to be that detailed	*Although it may be not the role of a policy to be descriptive on the use of specific indicators, some guidance should be provided on the appropriate use of indicators in the water plans, so that they are of interest to decision makers. Preferably, this should be done in a separate document to ensure consistency and for use elsewhere.*

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[21] Information targets are indicator points that are set throughout a project to gauge progress that can include quantitative as well as qualitative information concerning targets but also players, processes and structures Westley, F., B. Zimmerman, et al. (2006). Getting to maybe: how the world is changed. Canada, Random House..

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	b.	Is this information related to water?	*All information derived from indicators and other tools should be related to water to show their connections, especially when these are indirect.*		*All this information drawn from indicators should be related to water, particularly in those cases where the connection is indirect.*
4.2	a.	Are the increasing complexity of water issues, appropriate policies and actions taken into account so that they become coherent, consistent and easily understood?	*Increasing complexity of water issues, in terms of institutions, increased competition due to population growth, markets, etc., needs to be identified and documented or otherwise made explicit. Existing policies and actions need to be outlined and their relationship to each other as well as to the assessed items explained clearly. An understandable picture of the overall situation should be created that shows how all parts work together, identifying inconsistencies so they can be addressed. Findings from 4.1 form the basis for this.*	The Commission acknowledges that the policy is only part of a broader multi-objective decision-making framework that aims to balance economic, social and ecological aspects in water allocation decisions as per the objectives of the National Strategy for ESD. In the policy important linkages to WA's statutory framework are identified (s.1). The draft policy was a discussion paper as part of a water law reform process in WA to meet the COAG's Water Reform Framework Agreement. Ensuing amendments to the *Rights in Water and Irrigation Act 1914* were incorporated in the policy as were suggestions from 33 submissions. The most relevant documents referred to in the policy are the COAG Framework Agreement on Water Resources Policy Reform (1994 and subsequent agreements), the National Strategy for Ecologically Sustainable Development (1992) and the National Principles for the Provision of Water for Ecosystems (1996). The National Strategy for Ecologically Sustainable Development (1992), the Intergovernmental Agreement on the Environment (1992), the National Water Quality Management Strategy (1992) and subsequent Guidelines and the National Strategy for the Conservation of Australia's Biological Diversity (1996) as well as the Commonwealth *Environment Protection and Biodiversity Act 1999* are also relevant (s.1).	*The policy clearly identifies all relevant documents, agreements and legislation that relate to provision of water for the environment and establishes its concurrence with those (s.1). Coherency and consistency are ensured and generally the links are made clear and are easy to understand. However, this does not ensure that the increasing complexity of water resource issues is taken into account since the other documents may not recognise these either. Also, the policy context is quite narrow (see 1&3), so the complexity of water resources needs to be made more explicit. It is not clear how the increasing complexities of water resource issues are accommodated, although review processes that take new developments into account are provided for (p.5).*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
				The policy also provides some important sections of the COAG Agreement and the National Principles in Appendices 1 and 2. On a state level the *Rights in Water and Irrigation Act 1914* makes provisions for water for the environment in objects (i) and (ii) and the *Environmental Protection Act 1986* also has relevance in establishing environmental water provisions (s.1.3). Other relevant legislation is the *Conservation and Land Management Act 1984*, the *Wildlife Conservation Act 1950*, the *Aboriginal Heritage Act 1972* and the (Federal) *Native Title Act 1993*.	
5		**Ongoing Responsiveness and Efficiency**			
5.1	a.	Do institutions and processes serve all stakeholders, including water?	*It is important that institutions and processes do not exclude any stakeholders either by design or inadvertence; they need to be inclusive (see also 2.1)ensuring that water is considered as a 'stakeholder' with reluctant parties also being identified and included as far as possible.*	There is a general reference to 'all relevant stakeholders' (s.3.3) but no reference to any specific stakeholder groups besides indigenous people.	*More details should be provided with regard to potential stakeholders, who they might be and how it can be ensured that nobody is disadvantaged in any of the processes or institutional arrangements. Water (cycles) should be considered the prime stakeholder as a matter of course and be well represented.*
	b.	Are institutions and processes responsive to change and uncertainty with particular attention to water?	*Ongoing monitoring and review needs to be ensured (through expertise, finances, administration, processes, etc.) and new insights and knowledge need to be incorporated on an ongoing basis to effectively deal with change and uncertainty (e.g. Pahl-Wostl, Sendzimir et al.*	The need for ongoing monitoring is recognised and required and also should be ensured in water management plans (although this is not specified). Time frames are given (5 or 7 yrs) but changes can be made any time in case new information is obtained (s.3.2). Regular review of allocations and EWP occurs according to the *RIWI Act* as required. Although this is an iterative and adaptive process responsiveness to change is difficult to ascertain and would depend on individual circumstances.	*It appears that institutional processes are responsive to change and uncertainty allowing for review when new information comes to light. However, the policy is a little vague with regard to monitoring of EWP and allocation licenses and more specific information with regard to what constitutes a case for monitoring*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			2007) (see also 5.1.1 and 5.1.2). This needs to occur with particular attention to water in its direct and indirect guises, ensuring that no important issue is overlooked or under attended.		*or review would be useful, so that it can be included in water plans from the start. Care should be taken that all important changes in the water system, direct and indirect ones, are accounted for.*
5.1.1	a.	Does the capacity exist to determine trends through measurements that are iterative, adaptive and repetitive?	*The capacity to undertake regular review and analysis of trends as well as making the necessary adaptations needs to be provided. This requires adequate human, financial and procedural resources.*	The adaptive character of water resource management and allocation, including the setting and reviewing of EWP, is acknowledged. Iterative and repetitive measurements are not made explicit, but are implied by monitoring (see also 5.1.b).	*The capacity to determine trends should be given through the prescribed monitoring; possibly some more detail with regard to monitoring responsibilities, capacity and reporting would be helpful (who has to do what, how and what triggers which response). This could be included in a separate document as that suggested in 4.1.8a.*
	b.	Do the measurements show the effects on the water system?	*Measurements should be made with their relevance to the water system in mind; highly relevant ones should be preferred if possible and appropriate, depending on the context; if the measures relate indirectly to water only this may be more difficult.*		*Both direct and indirect measurements that are related to the water system should be included.*
5.1.2	a.	Is there commitment to ongoing review of performance?	*Performance review is a standard process in a responsible institution or organisation. It makes review meaningful, especially if*	There is no specific reference to performance review of the Commission and it is not clear what happens if the policy is not reviewed or monitoring does not occur as required. Some of this detail may be found in the *RIWI Act.*	*There should be some reference to performance requirements or review of the Commission, or if this is presented elsewhere, e.g. the RIWI Act, then this should be*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			findings are translated into useful adaptation and change; this should occur with particular emphasis on water and Water Centrality.		*stated. Such performance review should assess progress toward* Water Centrality.
	b.	Are goals, frameworks, processes and indicators adjustable in light of new insights and emergence of traditional knowledge with emphasis on water?	*New knowledge, particularly that related to water, needs to be distributed and incorporated where applicable so that changes can be made as appropriate. This has to be ongoing and enshrined in review processes.*	Yes, they should be. The policy is considered for major review every 5 years but minor changes can be made at any time with approval of the minister. Allocation plans and EWP can also be adjusted in light of new emerging information. Reference to processes is not made.	*It appears that goals, frameworks and indicators are adjustable in light of new insights at any time, as long as the changes are minor. It is not clear what happens with regard to major changes outside the prescribed timeframes and also with regard to processes; details should be given on those aspects. It should be ensured that new knowledge is related to water, directly and indirectly.*
5.1.3	a.	Is feedback on decision making encouraged with particular attention to water?	*Feedback ensures that problems with decisions are detected before they escalate. Changes can be made if appropriate and ultimately acceptability of decisions and outcomes to stakeholders can be increased. Particular attention should be on water.*	It is not clear if feedback or community input is sought after decisions are made or how this would be done. However, public input is sought when EWPs are determined and in the preparation of water allocation plans. Comments are also sought on draft and modified plans (s.2.4, 3.1 & Appendix 3). EWPs can be reviewed when new information comes to light (s.3.2).	*It appears that there is no feedback encouraged on decision making, and more detail should be provided. If the opportunity for feedback on decisions is not given this should be rectified, ensuring that particular attention is paid to water.*
5.2	a.	Is collective learning and its development promoted?	*Collective learning is not only based on review but entails active seeking of new ways of doing and new and hidden or obscured knowledge (e.g. Pahl-Wostl, Sendzimir et al.*	This is not expressed as such, although ongoing research is supported (s.2.4). Generally, the public and non-agency stakeholders are included in the determination of environmental and social values but have limited input into how these values are determined and decisions made (s.2.4 & 3.2). The Commission requires users to be responsible	*More information regarding collective learning is required since detail is lacking. At present learning seems to be limited to research and consultation. If collective learning is not*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			2007).	for the efficient use of the water allocated to them and to minimise ecological damage from water use (s.2.4 p.5). However, there is no indication how this is to be done (education, awareness raising, policing?). The Commission is committed to join national processes that develop and improve approaches to determine EWRs (s.2.4[6]).	*envisaged this needs to be rectified especially with regard to government-community partnerships.*
	b.	Is collective learning emphasising and relating to water?	*Any learning should be related to and emphasise the connections to water to promote awareness of* Water Centrality *and water relationships (Centre for Ecoliteracy 2000).*	See 5.2a.	*Such collective learning should highlight relationships and connections with water to help raise awareness and progress* Water Centrality.
5.2.1	a.	Is there commitment to ongoing search for new, traditional and indigenous knowledge?	*The discovery of knowledge needs to be supported on an ongoing basis to ensure long-term increase of knowledge which allows for the best possible decisions to be made.*	There is reference to continued encouragement and support of as well as conduct of research by the Commission with regard to "water regime requirements of significant ecosystems within Western Australia" (s.2.4[6]).	*The focus of knowledge improvement is very narrow only concerning "water regime requirements of significant ecosystems within Western Australia" (s.2.4[6]) and needs to be broadened to include community. It may be helpful to indicate how other forms of knowledge besides research are encouraged.*
	b.	Is the ongoing search for knowledge emphasising water?	*Water-related knowledge and the knowledge of water relationships are particularly pertinent to* Water Centrality *and should be fostered specifically (see e.g. Centre for Ecoliteracy 2000).*	Yes, ongoing search for knowledge is related to water.	*Knowledge should be sought more widely in accordance with 1.1 and be related to water in all its forms and to all values.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
5.3	a.	Are decisions made with the aim of achieving economic efficiency, ecological effectiveness and a functional water system?	*It is important to meet the needs of stakeholders and users while making the best use of available resources (which are usually limited) and doing the least possible harm to the environment and the water system in the process.*	The focus is on ecosystem protection but in the determination of EWP economic considerations are taken into account. However, there is no reference to any economic efficiency considerations or financial arrangements or review in any other context	*With regard to the determination of EWPs of GDEs ecological effectiveness seems generally ensured, but this scope should be broadened to include other ecosystems and other relevant aspects of the water system (see 1.1 and 3.1).* *With regard to economic efficiency, no information is provided but this may also be beyond the scope of the policy, in which case appropriate reference to other documents or avenues is necessary.*
6		**Institutional and Community[22] Capacity**			
6.1	a.	Is ongoing support in the decision making process provided?	*Guidance for decision making should be provided to organisations and individuals as appropriate to ensure that well informed, practical and reasonable decisions are made that suit the situation. Support also includes appropriate human and other resources and capacity.*	The commission is staffed and has a budget, so the basics are covered, at least to a certain extent. No mention is made of decision making capacity. Level of support to the community is unclear, but the community is not directly involved in decision only through input before and, to a limited extent, after decisions are made.	*Generally, the policy advocates community involvement but not in the actual decision making process. Ongoing support in the decision making process may be beyond the scope of this policy but information to that effect should be made available for reference, possibly as a separate document if appropriate.*
	b.	Is ongoing decision support highlighting	*Any decision support should ensure that water is*	Water is not mentioned in a decision support context	*Any decision support should have water as a central concern.*

[22] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others Adams, D. and M. Hess (2001) Community in public policy: fad or foundation? *Australian Journal of Public Administration* **60**, 13-23 DOI: 10.1111/1467-8500.00205.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		water?	*considered, directly or indirectly, as appropriate.*		
6.2	a.	Is institutional capacity for data collection, maintenance and documentation as well as for auditing these provided?	*Basic prerequisites such as facilities, training, human and financial resources as well as processes need to be available on an ongoing basis (see also 6.3).*	Yes, although this is not directly stated in the policy. The commission is responsible and has premises as well as administrative capacity. However, financial capacity may be limited, especially with regard to research.	*The policy does not provide any detail on institutional capacity. However, the commission had capacity to conduct its business although funding to conduct research and administration were limited. This situation may have changed now since at least a part of the original Commission has moved to the Department of Water (DoW), which appears to be well funded.*
	b.	Is institutional capacity for data collection, maintenance, documentation and auditing appropriate for water?	*Facilities, training, human and financial resources as well as processes need to be designed so that water issues are considered throughout and as appropriate for direct and indirect water issues.*	1) Yes, this capacity relates to water, although there may be neglect of some areas of the water system since not all values of water are included in the policy.	*Institutional capacity should be appropriate for water but care should be taken that all forms and values of water are covered.*
6.3	a.	Is there commitment to ongoing institutional capacity building and modernisation or renewal?	*Mechanisms need to be in place that ensure ongoing review and renewal in the face of new information and knowledge but institutions also need to actively seek learning and progress to ensure that the needs of stakeholders and users are met on an ongoing basis. The principles of social learning may be usefully*	The commission has the capacity to undertake the assessments but is constrained by available information (and lack of funding for research). Assessment is vested with the commission and it is assumed that appropriate capacity building is provided, but the policy does not deal with such matters. The restructure of the machinery of government and the formation of the new DoW could be seen as an indication of ongoing modernisation and renewal.	*The policy does not refer to institutional capacity building or renewal, and this may be beyond the scope of the policy, however, it would be useful to have a reference on how this is handled and what it entails, probably best published as a separate document that can be used for other relevant occasions and institutions. Institutional renewal has occurred*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			employed (e.g. Pahl-Wostl, Sendzimir et al. 2007).		*with the formation of the new DoW and the policy may need updating to reflect these changes. Broader learning avenues that include the community and other players should be explored.*
	b.	Is institutional capacity building and modernisation or renewal done with keeping water in mind?	*All capacity building and renewal or updates should occur in a manner that emphasises water and its central role as well as all its relationships, hence the mechanisms mentioned under 6.3.1 should cater for water and ensure that it is considered.*	The WRC and now the DoW are institutions that are dedicated to water.	*While the institutions to which the policy refers are dedicated to water any capacity building and renewal that occurs should ensure that all forms and values of water are accommodated.*
6.4	a.	Is community capacity building enabled, supported and facilitated?	*Community capacity relates to informal or organised interactions of people and resources existing within a community that aid in problem solving, provide the basis to adapt to change and maintain wellbeing (Goodman, Speers et al. 1998; Chaskin 2006). It is also called community development and refers to local empowerment and the ability of communities to help themselves, which depends on strong social cohesion and low incidence of social problems*	The policy does not refer to community capacity building or community development; it only requires people to use their water allocations in a manner that does not damage the environment.	*There is much scope for community capacity building and community development, which are not addressed in the policy but may aid in a better allocation process and minimise damage to ecosystems.* *This should be clearly addressed in the policy since the community at large is the most influential agent in effecting change and protecting the ecological values envisaged in the policy. The whole water system should be kept in mind at all times.*
6.4.1	a.	*Community*			

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		development Is capacity for participation and leadership developed and fostered?	*as well as development of self esteem, confidence, self-reliance and decision-making power (Department for Community Development 2005). Local initiatives need institutional and government support as well as resources, which include appropriate structures and processes (see also sections 2, 5, and 7) as well as those elements under 6.1-3 and 6.5. Social learning may also be useful in this context (e.g. Pahl-Wostl, Sendzimir et al. 2007). Water should be a central consideration in all these activities, highlighting the role of water in these and fostering (the awareness of) relationships with water.*		
	b.	Is skills development supported?			
	c.	Are resources provided (financial, social and technical) and is their prudent use ensured?			
	d.	Are social and inter-organisational networks fostered?			
	e.	Is the development of self-esteem, confidence, self-reliance and decision-making power supported?			
	f.	Is a sense of community promoted?			
	g.	Are all these efforts undertaken with water in mind or a focus on water?			
6.5	a.	Are institutions able to deal with all forms of water?	*Institutions are often set up to deal with blue (liquid) water or waste water or sewage but*	The policy only refers to 'blue' water and groundwater but only in the context of WDE.	*Only 'blue' and groundwater in context of WDE are considered in the policy; green, virtual water*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			have limited capacity to deal with green water, grey water (household waste water except toilet waste), black water (toilet waste),water vapour or virtual water (indirect water transfer through produce trade). This is true for formal[23] as well as informal institutions. The complexities of interconnectivities between these forms of water also need to be addressed as appropriate.		*and waste water are neglected as are the broader interconnections and implications. This should be rectified together with the broadening of the policy (see 1.1 and 3.1).*
7		**Transparency, Accessibility and Accountability**			
7.1	a.	Is information distributed freely within society?	*Information needs to be easily accessible and distributed actively throughout society, including to disadvantaged and less interested members. There need to be provisions and mechanisms for this to occur, e.g. good media exposure, distribution of written and other information, internet presence.*	The policy itself is available on the internet and can also be obtained from the Department of Water24. How much active distribution of information related to EWP is taking place or if this is encouraged is unclear and not made explicit in the policy. However, all the associated information is usually available publicly (at least through freedom of information [is this necessary here? explain?]).	*There may be improvements possible with regard to information distribution but this is a much larger issue and beyond the scope of this policy. Overall, it appears that information is easily obtainable and at least the major decisions are distributed through the media.*

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[23] Formal institutions are those set up in a formalised way, such as government departments, educational institutions or banks. Informal institutions are those that are not formally organised such as culturally based interest groups, although some of these, such as religious organisations, may also be formalised.

24 The Water and Rivers Commission (WRC) was disbanded in 2006 as part of a restructuring process in which the Department of Water (DoW) was formed. Parts of the former WRC is now associated with the DoW while other sections have remained with the former Department of the Environment which is now the Department of Environment and Conservation (DEC).

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
	b.	Is this information accenting water?	*The tenet of* Water Centrality *should be supported by emphasising water and its relationships wherever possible to increase water literacy; it should become a matter of course.*	This is a water policy and relates to certain parts of the water system.	*While the information contained in the policy concerns water, it is relevant to only a small part of the water system. A broader context or reference to a document that provides this (e.g. as outlined in 4.1) may be useful.*
7.1.1	a.	Are processes, institutions, methods data and information available and accessible to all?	*Institutions need to be contactable and accessible, in person and via phone and electronic means as well as with regard to structure and processes. The latter should be transparent, appropriate and uncomplicated. Data, information and methods need to be freely available to all interested parties. They need to be understandable and in a format that is accessible to all stakeholders and useful for decision makers (e.g. Dietz, Ostrom et al. 2003). It also means that information needs to be available in different forms (e.g. print, radio, TV, and internet) since not everyone can read or has a TV, buys a newspaper or has internet access.*	The policy refers to transparency of the process with information being made available to all stakeholders and the public at all times. If methods are included is not discussed.	*As long as an interested person is literate and knows where to look, information should be accessible and available. With regard to understandability and format, no information is given but some form of general reference or guidelines would be useful, although this may be beyond the scope of the policy.*
7.1.2	a.	Are all processes and decisions transparent	*It needs to be obvious and apparent which processes are*	The processes that are used to determine EWR are outlined in the policy, but with limited detail in some areas	*Although there is a commitment to transparency more detail needs to*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		and open to public scrutiny?	*applied, how they work and how they are used. It also needs to be clear how decisions are made and what the outcomes are. There need to be provisions for review and feedback (see also 5.1.3).*	(especially with regard to economic considerations) and reference to other documents, such as the *RIWI Act 1914*. There is commitment to transparency: "fundamental to these guiding principles is the overall principle of ensuring that the Commission's approach to providing water for the environment is "transparent". This requires the specific identification of EWRs and EWPs and particularly applies to situations where judgements must be made between the ecological, social and economic factors involved, for example where the proposed allocation strategy would mean that EWPs will not be the same as EWRs due to social and economic factors." (s. 2.4 p.5) However, there is scant information on how decisions are made and what the term 'transparent' implies and entails. Public scrutiny is possible but limited via community participation and submissions. Review and feedback opportunities are not detailed.	*be provided about what this means and what it entails. Overall, clearer description of processes is needed in some areas, especially with regard to consideration of economic aspects and decision making processes. The options for public scrutiny seem limited and should be expanded.*
	b.	Do all processes and decisions take water into account?	*Water needs to be considered in all processes and in each decision; this may be in the form of an extra clause or set of questions or, ideally, should be built in or even focus on water.*	Water is being considered in all processes and decisions.	*Water is considered in all processes and decisions, but the scope of the policy, or at least its reference or context, should be broadened to include the whole water system.*
7.1.3	a.	Are all judgements, assumptions and uncertainties in data and interpretations being made explicit highlighting what this means for water?	*All judgements, assumptions and uncertainties need to be revealed to reduce surprises, hidden agendas and the potential for corruption. This needs to be considered with regard to 4.1- whole system review and should highlight*	The policy acknowledges potential data uncertainty and lack of knowledge, in which case the precautionary principle is invoked. A particular case is mentioned in the identification of EWRs and EWPs, where 'transparency' is promised in "situations where judgements must be made between the ecological, social and economic factors involved, for example where the proposed allocation strategy would	*The policy needs to provide information regarding judgements and assumptions; how are judgements made and what are the assumptions used in decisions? If this is too much detail a more general reference to how these aspects are dealt with is needed.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			the potential and actual effects on the water system.	mean that EWPs will not be the same as EWRs due to social and economic factors." (s. 2.4 p.5). However, it is not explicitly stated how this is done and what happens with regard to judgements and assumptions, generally.	*All judgements and assumptions should take into account the actual and potential effects on the water system.*
7.2	a.	Are documents, processes and institutions designed to address the needs of the audience and users?	*Documents produced by and processes used in all institutions need to be understandable and user friendly. They also need to be relevant and appropriate to the audience, the process or institution in question. The institutions themselves need to be accessible and relevant, avoiding duplication or unnecessary complexity.*	The policy is written in an understandable manner and contains a glossary and appendices with definitions and explanations. A flowchart of the EWP process is included, while information on decision making processes is quite vague. The policy addresses the needs of relevant government organisations. If it addresses the needs of a wider audience and the general public is harder to determine. There is no reference to institutional design.	*Overall, the document is quite user friendly and understandable (see also 7.2.1). The relevant processes are described although more detail on how decisions are arrived by should be provided. Institutional design is not addressed and may be outside the policy's scope (a separate document for referral may be useful).*
	b.	Are documents, processes and institutions designed to address the needs of water?	*Documents and processes should be well thought-out, relating to and emphasising the roles and values of water. The institutions themselves should be designed with water in mind; conceptually, water could be used as a role model to set up processes and other elements, e.g. information flows and data pools; physically, buildings and settings should cater for water through appropriate setting, architecture, building methods*	The policy caters for water, but only a part of the water system.	*While the document and described processes cater for water, the institution itself may need to be assessed for its set-up. The physically as well as conceptually the processes and physical elements, including building, should cater for water and use it as a role model.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			and materials, interior design, infrastructure, etc.		
7.2.1	a.	Is the structure simple and is clear and plain language used that features water?	*The structure of documents and processes should be uncomplicated and unambiguous to enable ease of reading and use, for understanding without hidden meanings – flow and clarity. The language used must be plain and clear, using water metaphors where appropriate, with as little jargon as possible, for everyone to understand. Using water metaphors where appropriate enhances water awareness.*	The structure is relatively simple and a table of contents is provided. Much of the information contained in the appendices is very important for clear understanding. The language is plain with specialist terms defined in the glossary. More 'water language' could be used.	*Overall, the document is easy to read and understand; jargon is kept to a minimum and explained in the glossary. Some of the essential information from the appendices could be included in the main body or referred to better. A better numbering system for paragraphs may be useful for easier referral. Water metaphors could be used to emphasise the nature of the policy and aid in spreading water awareness.*
7.3	a.	Are government, private sector and civil society organisations accountable to the public and the interests they represent including the water system?	*Some form of public review or accountability process should be in place (e.g. such bodies as the Auditor General, the Ombudsman or the Senate Estimates Committee could be utilised/adapted) to ensure that organisations actually deliver what they are supposed to and that the possibility for corruption is minimised. Such system should have a focus on water in all its forms, ensuring that the water system is represented and considered*	There is no reference to a review of the Commission itself or its accountability.	*No reference to accountability is made. This may be outside the scope of the policy but this information should be available somewhere and needs to be referred to in the policy. Accountability should also be to the water system.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			always.		
7.4	a.	Are responsibilities assigned clearly with accent on water?	*Responsibilities need to be allocated to the organisation(s), person(s) or institution(s) that can best deal with particular elements of the water system so that good outcomes are ensured. All roles need to be well defined and supported (see 6.3) and need to include conflict management and resolution mechanisms (see e.g. Dietz, Ostrom et al. 2003).*	Yes. The commission, the minister and the stakeholders/public all have designated roles that are outlined in the policy.	*Responsibilities of the major players are all clearly assigned.*

Appendix D

Full *Water Centrality* Instrument Application to

'Infancy to Young Adulthood': A Mental Health Policy for Western Australia (Department of Health 2001)

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
1		**Strategic Vision**			
1.1	a.	Is there a clear, broad and long-term vision?	*The vision is a statement of the overall aim. A succinct formulation should capture in easy to understand and broad terms what is to be achieved in the long run. It should inspire by being sensible and credible, sound and well-reasoned as well as emotionally appealing and vividly presented.*	There is no explicit vision. Paragraph 5 in the foreword sums up the intention of the policy ("It is important we work in a positive and preventive manner to ensure that the majority of children and young people maintain high levels of mental health. We need to continually promote positive mental health and provide prevention and early intervention services for those children and young people who develop, or are at risk of developing, mental health problems. For those children and young people who have persistent and severe problems, specialist mental health services need to provide appropriate and accessible assessment, treatment and support."), but is not worded as a vision or identified as such. The introduction also alludes to some broad visionary issues but without explicitly providing a vision.	*No overall vision statement is provided; content in the foreword and the introduction could be amalgamated to form a vision, which would be useful to clearly show the intentions of the policy and make them easily accessible.*
	b.	Does this vision reflect the centrality of water for life?	*The central role of water is taken into account and acknowledged in the vision. The centrality of water refers to its absolute importance for life and overall system function.*	No reference is made to water.	*A vision should reflect the importance of water for life; in this case it could highlight the importance for mental health, in a physical as well as mental and emotional context.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	c.	Is the vision defined by goals or objectives that also reflect the centrality of water for life?	*The goals define the vision in a more tangible and detailed way and show the importance and centrality of water, i.e. the connection water has with all aspects of life.*	Five objectives outline the aims of the policy: prevention of mental health problems and disorders; reduction of onset, severity, duration and recurrence of mental disorders; provision of effective treatment and support; improvement of capacity of system of care. The centrality of water is not reflected in these.	*The objectives should reflect the centrality of water and could highlight the potential role of water in the prevention and treatment of mental disorders.*
1.2	a.	Are ethical principles made explicit that may be represented by traditional water rights, human rights and indigenous lore of relevant societies?	*Ethical principles such as those represented by human rights, including the right to water, should be ensured. Traditional water rights may be taken into consideration if they represent ethical principles. Traditions and lore may need to be reviewed for their ethicality, e.g. inequitable distribution of water may not be acceptable even if it is a traditional right. This would best be embedded in a* Water Centrality *Charter.*	Ethical principles are not made explicit but are implied throughout the document. The existence of this policy alone reveals an ethical stance with regard to rights to health, wellbeing and health care. There is attention to cultural diversity and a culturally sensitive approach to mental health care for young people. However, there is no reference or connection to water.	*Ethical principles could be made more explicit, e.g. reference to the* Convention on the Rights of the Child (Office of the United Nations High Commissioner for Human Rights 1998) *could be made.*
1.3	a.	Is broad consensus aimed for with regard to the best interest of the group and, where possible, policies and procedures to benefit the water system?	*Broad consensus[25] is more than a majority rule or decision; it means to achieve broad agreement, a common base through negotiation and conflict management to ensure acceptance of outcomes and enable implementation. This requires*	Broad consensus is not mentioned explicitly but the policy is in accord with the National Mental Health Strategy and the WA Department of Health strategic directions (section 2), which implies consensus at government level. The Principles for the Provision of Specialist Mental Health Services (section 7) include involvement of families, consumers and carers in all aspects of planning, delivery and evaluation (p.6).	*There appears to be some form of consensus within the mental health services area although this would need verification outside of this document. The level of agreement within the broader community and service users seems more tenuous although the intention to include all*

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[25] The WCI is an organising tool that by itself cannot achieve consensus; conflict management, not conflict resolution, should be used to harness the creative potential of conflict and tension Dietz, T., E. Ostrom, et al. (2003). The struggle to govern the commons. *Science* **302**(5652): 1907-1912. and reach a common accord or basis from which to proceed that does not imply uniform opinions or total agreement

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			participation of all relevant stakeholders and decision makers (see also 2.1) and aims for the 'wellbeing' of the water system.	The Tiered System of Care (figs.1&2) is based on the proceedings from a mapping exercise published by the WA Health Department, which could imply that many people were involved in its design. There is also reference to partnerships and collaboration throughout the document, in particular section 8.7 (p.19).	*involved parties could potentially go a long way towards consensus, if implemented.*
2		**Participation and Voice**			
2.1	a.	Are affected and interested parties, including non-human interests and water, represented and do they have a voice throughout processes of policy and decision making?	*It is not sufficient to state that all relevant stakeholders are included. Explicit listing of stakeholders (including women, youth, indigenous people and non-human life forms) would be useful in most cases. Representation of non-human life forms as well as water should be ensured through advocacy.*	All stakeholders are listed in the relevant sections that talk about involvement and partnerships. Since this policy focuses on children and youth these are specifically mentioned as are their parents and carers; there is explicit mention of involvement in policy making, planning, priority setting and evaluation of the whole system of care (p.19). Indigenous people and children from culturally and linguistically diverse backgrounds (CALD) are also mentioned in the context of requiring particular attention. Service providers and professionals, consumers, researchers and academic staff are identified for collaboration in research agenda setting.	*The intention to include all relevant stakeholders is made explicit. Actual implementation remains to be seen with little reference how this could be done or operationalised (although this may not be a role of this policy but rather identified in the regional plans that are provided for).*
	b.	Is recognition of diverse and changing values ensured through this?	*Consideration of all values should be ensured through appropriate processes (see also 2.1.1.b). Changes over time need to be dealt with on an ongoing basis (see also 5).*	Section 8.6 acknowledges cultural diversity and recognises the importance of reflecting different values and attitudes in the services. The diversity of values is recognised in particular for people with CALD and indigenous people, identifying the need for culturally sensitive and specific services (p.17&18). Reference is made to a transcultural mental health policy that the DoH will produce (p. 18).	*Diverse values are well recognised and included in service delivery, particularly for indigenous people and people with CALD[26]. It remains to be seen what the proposed DoH transcultural mental health policy will bring to judge how changes will be accommodated.*

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[26] children from culturally and linguistically diverse backgrounds

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
2.1.1	a.	Are freedom of association and speech assured?	These are basic human rights without which full participation cannot occur. The UDHR[27] affirms the right to free speech so does the ICCPR[28]. Australia is a signatory to both but has not enshrined free speech into legislation and hence it is not enforceable in court, while freedom of association was mainly granted with regard to unions in Australia. The situation may require attention since these rights are not automatically ensured and should be officially enshrined in some form as well as being enforced. Arguably, a form of participative democracy would best suit Water Centrality to enable fuller participation overall.	There is no particular reference being made to these rights.	Freedom of association and speech may be implicit in Australia although there may be situations relevant to this policy in which these and other Human Rights may need clarification.
	b.	Are capacities to participate constructively ensured?	Constructive participation is based on accessibility, openness and fairness (see also 5 and 6) but also should ensure that participatory processes are	In addition to strategies aimed at improving the level of service delivery to previously disadvantaged groups, including indigenous and CALD people, such as increasing cultural competence of services and develop culturally specific services, which includes	The policy seems to address issues of cultural and other disadvantages of potential patients and carers as well as aiming to increase knowledge and awareness of mental

[27] Universal Declaration of Human Rights (UDHR), Article 19: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

[28] Article 19(2) of the United Nations International Covenant on Civil and Political Rights (ICCPR) (1966) states that: Everyone shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of his choice. The ICCPR forms Schedule 2 of the Human Rights and Equal Opportunity Commission Act 1986 (Commonwealth).

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls →Improvements
			tailored to the participants so they are not disadvantaged because of gender, ethnicity, age, economic or literacy status or other potential impediments (see also 7).	staff training and the development of a transcultural mental health policy, there is mention of developing mechanisms for joint planning, development and coordination of services as well as capacity building for service providers and enhanced linkages between all services. Development of effective partnerships with families and communities includes family, consumer and carer participation in policy development, service planning, delivery and evaluation. Access to services will be improved by basing them in communities with regional coordination using flexible service delivery. Educational information will be provided as well as strategies to improve understanding of mental health and services.	*health issues. While issues of access to services and cultural hurdles are addressed other elements such as literacy or access to online information is not addressed, which should be remedied.*
2.1.2	a.	Is the participation of decision makers ensured to secure a firm link to adopted policies and resulting action that benefit water?	*Decision makers are stakeholders who need to be included from the start, preferably in the planning stages, so that coherency and implementation are ensured to the benefit of water.*	Throughout the policy the DoH is mentioned or its involvement implied. The policy itself seems to represent a commitment for ongoing involvement.	*The intention of the policy to include decision makers at all levels of service provision seems clear.*
3		**Equity and Fairness**			
3.1	a.	Are the ecological conditions and the central role of water on which life depends considered for equity amongst all life forms?	*Changes in ecological conditions can have far-reaching consequences and need to be identified so they can be addressed. In this, all life forms, including humans, need to be treated equitably due to interdependence.*	No reference is made to ecological conditions.	*The role of ecological conditions for mental health may not be obvious but a functioning environment and ecology are essential for human health and wellbeing, which should be acknowledged.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
	b.	Is the central role of water for those ecological conditions considered?	*Without water there is no life, so water availability is central to all ecosystems and life forms as well as their functions. This should be acknowledged clearly.*	No reference is made to the central role of water in maintaining ecological conditions.	*The central role of water in maintaining ecological conditions should be made obvious.*
3.1.1	a.	Do all groups in society as well as non-human life forms have adequate access to water to ensure opportunities to improve their wellbeing?	*Adequate access to water is the basis for existence and wellbeing for all life forms, human and non-human. Hence, existing ecosystems and human populations need to have at minimum sufficient water for survival. Humans are part of the ecosystem and rely on healthy ecosystem function hence this function needs to be ensured while human needs also have to be covered beyond mere survival (see Chapter 2). Decisions should be based on information and knowledge and human influences have to be balanced accordingly.*	This policy does not consider access to water.	*While access to water may not be an obvious concern for the policy the role of water and access to it should be explored in the context of mental health.*
3.1.2	a.	Are intra- and inter-generational equity and disparity considered in terms of resource use and access, water quality,	*Equity is essential for Water Centrality. All people should have equal rights and obligations as well as equal opportunity to the listed issues, as a minimum[29]. The needs of future generations must*	Intra-generational equity is considered explicitly in the policy with regard to access to mental health services for children and young adults and some anticipatory measures are taken to ensure service delivery in the future. The other issues are not addressed explicitly in the policy.	*While intra-generational equity in terms of service access is well considered in the policy and anticipatory measures are taken for future service delivery issues such as resource use and access, water*

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[29] Rawls (1971) argued that if there is to be liberty of opportunity, then opportunity must exist for all in every institution. If water doctrines do not promote equality of liberty of opportunity in access to water, then the liberties of the whole society are reduced. Tisdell, J. G. (2003). Equity and social justice in water doctrines. *Social Justice Research* **16**(4): 401-416.

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		pollution, poverty, over-consumption, human rights and access to services?	*be considered as well as the needs of the people currently alive. Considerations need to include equity between regions, e.g. in inter-basin water transfers.*		*quality, pollution, poverty, over-consumption, human rights are not addressed. While some of these issues may have limited and indirect relevance these connections should be explored.*
	b.	Are these considerations in 3.1.2.a related to water?	*Water is essential to or interacts with most of these considerations (see 3.1.2.a) and hence these relationships need to be explored appropriately.*	No. Water is not considered in the policy.	*The considerations of 3.2.1.a are not related to water but should be explored in that context to ascertain the connections with mental health.*
4		**Integration and Coherency**			
4.1	a.	Is there a review of the whole system as well as its parts?	*A review of an entire system may be difficult and complex, depending on the system in question, but has to take place at some stage (rather sooner than later). Systems can be encapsulated within other systems and different scales may need to be considered depending on the situation.* *It would be useful to do a review of the whole water system and all water cycles showing interconnections as well as direct and indirect effects, so that this can be referred to in reviews of lower scale systems and used to place these systems into context (in a nested approach) since a*	There is no review of the existing mental or youth mental health system in the policy, but provisions for a review of existing services is made in the regional plans that will be developed (p.14). However, a tiered system of care to promote mental health and wellbeing of children and young people that is intended to be developed in WA is introduced (figure 2, p.9-10). This system seems quite comprehensive and is supposed to be integrated across service providers and agencies while being community based and regionally planned. The integration with a broader system of care is alluded to with details being provided in regional mental health service plans that will be developed. The connections to the water system are not mentioned.	*It could be advantageous to have a review of the existing mental health care system, although ideally this should have been done in preparation for the new policy. The description of the 4-tiered system of mental health care for youth provides a good basis from which the whole system could be explored. It would be advantageous to represent the system in form of a conceptual model that shows clearly the different levels of care providers and their interactions so that it is easily understood and accessible to providers, administrators and care recipients and their carers alike. The connections between the different policies that are interrelated on a*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			subsystem cannot stand alone. A conceptual model of the system in question showing all the connections to water should be produced. Such a review requires a participatory approach, such as mapping exercises and others. Methodologies such as input-output analysis of water use (Lenzen and Foran 2001) may be useful. The values of water (Chapter 2) may be a starting point and rough guide.		*state and national level should be shown more explicitly. The various regional plans could then refer to and be put into the appropriate context with the review. The connections to water should be made explicit in this model and review, and the connections to the whole water system model (in cases where such model has been produced) should be made clear. The connection of mental health and the values of water should be made explicit.*
	b.	Is the central role of water being made explicit in the system and its parts?	*This is paramount since water is the source of life. It includes direct as well as indirect roles of water. The whole water system review should serve to make the central role of water explicit, with quantitative as well as qualitative aspects (values of water, input-output analysis (e.g. Lenzen and Foran 2001)).*	The central role of water is not made explicit.	*The central role of water should be made explicit for the youth mental health system and its parts. The values of water could be used as a guide, especially those pertaining to physical and mental health.*
	c.	Are the implications and potential impacts for all water cycles considered?	*These include the local, regional and global water cycles as well as those above ground and underground in liquid, vapour and solid (ice) form, taking into consideration living and non-living elements. The virtual water cycle may also need to be*	No consideration is given to water cycles.	*Water cycles are not considered but should be explored for their relevance for mental health.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			considered.		
	d.	Are the connections and interdependencies of water considered?	*Since water is central to life its connections and interdependencies need to be explored fully.* *The review of the water system should show this. A form of input-output analysis may be useful.*	No, connections and interdependencies with water are not considered.	*The interdependencies and connections of water with mental health are not considered but this should be remedied to tie in the mental health system with the water system.*
	e.	Is sufficient knowledge available about the system and its parts? If not, are provisions made to address this?	*This has to be determined on a case by case basis.* *If insufficient knowledge is available efforts should be made to remedy this (see also 6.3, 6.7, 7.3 and 7.4).* *In the meantime the precautionary principle should be adopted. Review and update regularly.*	There seems to be considerable knowledge available about the youth mental health system, as shown particularly in sections 1, 4 & 8, however, at the same time, especially sections 8.4, 8.6 and 8.8 highlight that more knowledge is needed and that capacity building should be part of the new strategy.	*The gaps in knowledge about the youth mental health system seem to be reasonably well known and measures are envisaged to address these.*
4.1.1	a.	Is the wellbeing, its state as well as the direction and rate of change, of the ecological subsystem and its component parts considered with regard to water?	*The ecological subsystem* comprises all living things and the cycles they rely on as well as the role water plays in these. Although humans are part of this subsystem they are considered separately in the social subsystem (4.1.1.b) due to the extensive influence we have on the water system.* **It seems useful to explore the subsystems separately and in detail to facilitate better understanding, but it is important to take note of any*	Geographic factors will be taken into account to determine regional needs in regional plans. Other ecological elements are not explicitly considered.	*Considering geographic elements in regional plans is important but the broader ecological subsystem should be considered, especially given the progressively emerging insights about connections of human and ecological health, biophysically as well as mentally and emotionally.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			interconnections with other subsystems so they can be taken into account (in 4.1.1.d). Trends need to be identified in order to anticipate change and prioritise actions. It may be useful to have a generic conceptual model of the system in question to guide exploration (the review of 4.1 could be a useful guide).		
	b.	Is the wellbeing, its state as well as the direction and rate of change, of the social subsystem and its component parts considered with regard to water?	*The social subsystem refers to human endeavours, activities and institutions and the cycles they rely on as well as those that depend on human interaction (see also Chapter 2).* *Those concerns directly to do with physical survival are not strictly social but are included for the sake of simplicity. (See also* at 4.1.1)*	The social subsystem is considered as far as it relates to youth mental health, with emphasis on service delivery. Demographic and socioeconomic factors are mentioned for consideration in regional plans while other social subsystem elements are limited to those identified for indigenous children (social adversity, poor health outcomes, cultural sensitivity) and CALD (cultural differences). The policy arose from the need to change the youth mental health system and service delivery in WA and it presents the envisaged activities and the relevant institutions quite well. Infant to young adult mental health is identified as an important concern with emphasis on prevention and service access. However, water is not a factor in any of these considerations.	*The policy has a social service focus aimed at redressing shortcomings of the existing youth mental health system. This includes how previously disadvantaged groups, i.e. indigenous people and CALD, can be better included and how services to rural and remote areas can be improved. While the state of the system and the direction of change seem to be well-considered information on the rate of change is sketchy. None of these considerations are related to water. Changes to the policy should include timing of changes and make connections to water obvious.*
	c.	Is the wellbeing, its state as well as the direction and rate of change, of the economic subsystem	*The economic subsystem is arguably a subsystem of the social (or human) system but since economics appears to be of great importance to humans it is dealt*	Socioeconomic factors are to be considered in regional plans to determine regional needs. The need for adequate funding for specialist mental health services has been recognised, which had been neglected prior to 1996, but growth funding has been	*While improvements to funding and resource levels of service provision and training are under way, there is little reference to socio-economic factors that affect patients and how*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		and its component parts considered with regard to water?	*with separately. This subsystem relates to the production, distribution and trade of goods and wealth and needs to be related to water. (See * at 4.1.1)*	allocated in more recent years. No reference to water is made.	*they will be dealt with, although this may be the role of the regional plans. More emphasis could be placed on economic aspects relating to service recipients and the influences on mental health, need for services and service delivery. Overall, connections to water should be made clear.*
	d.	Are the wellbeing, the state as well as the direction and rate of change, of the interactions of the subsystems and their component parts being considered with regard to water?	*All three subsystems interact and therefore it is an important if complex (and often neglected) task to fully explore the interactions of all subsystems to detect trends, opportunities and threats that arise from these interactions.*	The interactions of the subsystems are not mentioned besides implications that insufficient funding in the past has affected service delivery and is being remedied by providing sufficient funding for service delivery, capacity building and education and an integrated strategic policy. Water is not mentioned.	*There is a lack of consideration of interconnections beyond the recognition that appropriate funding is needed for adequate service delivery and staff training. The interconnection between ecological, social and economic elements should be explored beyond these insights and connections made with water; e.g. there may be effects on mental health and the mental health system through shortages in water, increasing water costs and climate change.*
4.1.2	a.	Are the positive and negative outcomes of human activities identified as monetary and non-monetary values of water (= ecosystem services of water), so that the costs and	*In all three subsystems both monetary and non-monetary values exist (are assigned by humans). All of them are important for a fuller picture of the outcomes of human activities, positive and negative, for both humans and ecological systems (since without functioning*	Values of water are not identified in this policy.	*The values of water should be identified and their costs and benefits to mental health highlighted.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
		benefits to human and ecological systems are reflected?	*ecosystems human endeavours are impossible).*		
4.1.3	a.	Are the ecosystem services of water fully considered?	*This needs to be done with regard to direct and indirect ecosystem services such as regulating functions (climate, flooding, disease, water purification etc.) and supporting functions (e.g. nutrient cycling, soil formation and primary production) (Millennium Ecosystem Assessment 2005). All these services depend on water or are connected to it (see also Chapter 3.2).*	No.	*The ecosystem services of water may be indirect and obscure with regard to mental health but they should be clarified to enable consideration of the broader context.*
	b.	Are the economic activities that contribute to human/social wellbeing considered with regard to water?	*This is a more detailed look at the monetary values, as well as trade and commerce activities related to water in terms of their contribution to human wellbeing (could be part of 4.2.1.c and 4.2.3.b).*	No.	*Similar to 4.1.3.a the context of economic activities that contribute to human wellbeing and their connections to water may be obscure but could be important for mental health and should be explored. This could include payment for services, building of facilities and instruments and activities of the pharmaceutical industry.*
	c.	Are the non-market activities that contribute to human/ social wellbeing	*A more detailed look at non-monetary values that contribute to human wellbeing and their relationship with water (could be*	Contribution of the health system to human wellbeing is considered with regard to mental health of children and youths, however, water is not considered.	*The policy is limited to activities within the (mental) health system and should be broadened to a wider social and relational context (e.g.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		considered with regard to water?	part of 4.2.1.b, 4.2.2.a and 4.2.3.b).		neighbourhoods, living conditions) and highlight the role of water.
	d.	Are the interactions of the ecosystem services of water as well as their economic and non-market values considered?	The interactions of the ecosystem services outlined in 4.2.3.a-c can oppose or negate each other and should be fully explored to anticipate or prevent serious implications for human and ecosystem wellbeing.	No.	The interactions of 4.1.3.a to c are not considered but should be explored to obtain a broader view and identify any confining or enhancing interactions.
	e.	Are all these elements considered in a local, regional, national and global context?	All these elements (4.2.3.a to 4.2.3.d) need to be considered with regard to these levels to ascertain their influences and extent and how they are best approached or solved. These contexts may overlap or be discrete but it is likely that more than one level will apply and cross-scale influences will need to be considered (see e.g. Dietz, Ostrom et al. 2003).	The policy has a regional and state focus but is linked to national policy and activities and also is interested in the community (local) level. The global context is not considered.	The local, regional, state and national contexts are considered however, the global context is missing, which should be remedied.
4.1.4	a.	Are the time frames long enough to capture all water system (hydrological cycle) time scales?	This depends on the water system(s) that are affected and varies with the nature of the assessed item and the spatial scale. However, all water systems and cycles are interdependent, which needs to be realised and acknowledged. Since it is not practical to do a full assessment of all water cycles in all systems in all cases, a full	A timeframe is not made explicit, although there is some reference to planning for the future and anticipating changes in mental health care needs and distribution of the 0-25 year old population (p.14). However, water cycles are not considered.	Time frames should be made more specific and be matched with water system time scales.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			inventory of water cycles and their interactions should be available elsewhere for reference.		
	b.	Are time scales appropriate to cater for future generations?	*This implies multiples of a human generation length (~25yrs).*	Although there is some concern for future developments it does not appear that the policy is aimed at dealing with timeframes that represent a generation or more.	*The time frames of the policy should be expanded to beyond the next generation.*
	c.	Are time scales appropriate for current short-term decision making?	*Should be suitable for the case in question and may include election or review cycles.*	Timeframes seem to be appropriate for short-term decision making.	*Time scales seem appropriate for short-term decision making although this could be made more explicit.*
4.1.5	a.	Is the spatial frame of reference sufficiently large to include both local and long distance impacts on water systems?	*Long distance and cross-scale influences (atmospheric, groundwater, rivers) can have great importance on local conditions and* vice versa. *Even if the assessment is for a small area the broader picture needs to be captured so that these influences can be ascertained (see also 4.2.3e).*	The spatial frame of reference includes local, regional, state and national levels; however there is no concern for water in this context.	*The spatial frames of reference range from local to national but no reference is made to the water system and any impacts on it (see 4.1.3).*
4.1.6	a.	Are historic considerations included in anticipating future conditions of water?	*Includes traditional, cultural, ecological, spiritual, legal, commercial, political and administrative heritage and their relationships to water. Their influence may be past or ongoing but all need to be considered for potential effect of the future of water systems.*	Historic considerations are mentioned in context of indigenous cultures in order to understand defences in cultural dynamics and indirectly by reference to a Ministerial Taskforce in 1996 that found years of neglect of the mental health system, but these are not connected to water.	*The policy arose in part as a result of a Ministerial Taskforce that reviewed the mental health system, hence, historic conditions regarding resources and facilities, as well as administration are considered. However, influences on future conditions of water are not examined and should be explored.*
	b.	Are current	*The current state of the water*	No, the current water systems are not considered.	*Current water systems are not*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		conditions of water systems considered in anticipating future conditions?	*system, in terms of water availability, quality, hydrogeology, ecology as well as allocation status, can determine future outcomes and needs to be documented and assessed, also as a reference point.*		*considered in any planning but should be included.*
	c.	Where could we go? Are all possibilities and alternatives considered?	*All scenarios and possibilities, including the 'no change' option and utopian ones, can be informative and inspiring and need to be explored to ensure that fully informed decisions are made.*	The policy describes one strategy and although it is acknowledged that the proposed tiered system is not set in concrete, there is no exploration of the existing system or any other potential options or alternatives.	*The suggested strategy may be the best available but there is no reference to an exploration of other options. It should be made apparent where the current proposal originated and what other options were explored and why they were discarded. All possibilities should be examined.*
4.1.7	a.	Is an explicit set of categories or an organising framework employed that links vision and goals to indicators and assessment criteria?	*A clear framework can help with identifying meaningful indicators and aid assessment (e.g. Peet and Bossel 2000); this needs to be linked to the vision and goals to ensure that intended outcomes are achieved. Review framework and indicators regularly for appropriateness.*	The policy makes reference to the standards and performance benchmarks that have been set in the *Service Provider Guidelines for Child and Adolescent Mental Health Services (CAMHS) in Western Australia*. This is based on the *National Standards for Mental Health Services* and is intended to promote continuity of service delivery and evaluation procedures across the state. No details are provided and no connection is made to the tiered system proposal.	*The* Service Provider Guidelines for Child and Adolescent Mental Health Services (CAMHS) in Western Australia *that are based on the* National Standards for Mental Health *may help afford consistency in health care provision, however, it should be mentioned how these are linked to the objectives of the policy and if these standards will be used in evaluation and how. It should also be explained how the suggested tiered system for mental health service provision is linked to assessment.*
	b.	Do the set of	*The framework has to ensure that*	There is no reference to water in the policy.	*It should also be explored how the*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* ➔ *Improvements*
		categories or the organising framework have water as a central concern and are the indicators and assessment criteria related to the water system?	*water is made a central concern and the indicators or the assessment criteria need to be chosen accordingly. While this would include obviously water-related elements, given that water is relevant for most aspects of interest to humans, at least indirectly, many 'non-water' aspects could also be valid.*		*guidelines are related to water, explaining particularly the less obvious relationships.*
4.1.7.1	a.	Are a limited number of key issues used for analysis?	*A limited number of key issues help reduce complexity. Ensure that key issues are correct and applicable through an inclusive participatory process.*	Yes, they are stated as to relate to outcomes for children, youths and their families, service delivery outcomes and macro policy outcomes.	*The number of key issues for evaluation seems limited and very broad. Some more detail would be useful although this may be provided in the CAMHS and should be stated if that is the case.*
	b.	Are these key issues related to water and *Water Centrality*?	*While most issues are related to water, at least indirectly, those that have the most obvious and relevant connections to the Water Centrality Principles should be chosen.*	No reference is made to water.	*Relationship of these key issues to water and* Water Centrality *should be highlighted.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
4.1.7.2	a.	Are a limited number of indicators or indicator combinations used that provide a clear sign of progress towards *Water Centrality*?	*Fewer indicators limit complexity, but they need to be relevant to what is assessed, in this case progress towards* Water Centrality. *A policy may not need to be descriptive in detail but should ensure guidance if subsequent processes or documents need to deal with this.*	See 4.1.7a and b.	*See 4.1.7a and b. Details on indicators or where they are outlined should be provided and reference made to* Water Centrality.
4.1.7.3	a.	Are measurements standardised wherever possible to allow comparison?	*Standardisation is usually not a problem for quantifiable measurements but can be more difficult for some qualitative data. Comparison is important for monitoring progress and trends.*	The importance of standardisation of measurements across services is recognised and envisaged for implementation, which will also be closely aligned to National consumer measurement initiatives. The development of a coordinated response to ensure compatible measures is proposed.	*The importance of standardised measures is recognised and envisaged for implementation; a check if these measures are sufficient should be undertaken.*
	b.	Do these measurements relate to water?	*Although most measurements can be related to water, at least indirectly, the most appropriate and relevant should be chosen.*	Water is not mentioned in the policy.	*Measurements should be related to water wherever possible and meaningful.*
4.1.7.4	a.	Are indicator values compared to targets, reference values, ranges, thresholds or directions of trends, as appropriate?	*Comparison is paramount to assess progress and trends. Indicators can be quantitative or qualitative and include not only bio-physical and socio-economic but also political measures, e.g. policy and legislation. Performance targets should be complemented by information*	There is no mention of this in the policy; the CAMHS would need to be reviewed for this.	*The policy should make reference to targets. If there are targets in a relevant document elsewhere this should be mentioned.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			targets[30] to allow for ongoing evaluation and course corrections.		
	b.	Do these values relate to the water system?	*Indicator values as well as target values should be related to the water system as explicitly as possible.*	The water system is not mentioned in the policy.	*These targets should relate to the water system, even if only indirect connections are possible.*
4.1.8	a.	Is information drawn from indicators and other tools that are stimulating and serve to engage decision-makers?	*Meaningful and relevant information is best, but may not be readily available and an ongoing search for information and knowledge is needed (see 5.2.1). Decision makers need to be interested to ensure ongoing involvement, commitment and appropriate decisions.*	See 4.1.7.3.a. Evaluation will be undertaken regarding outcomes for service recipients, service delivery and macro policy.	*Evaluation regarding outcomes for service recipients, service delivery and macro policy should be suitable to engage decision makers, although it is not quite clear how interest in the outcomes will be achieved beyond the policy intentions. Reference should be made to indicators or tools that might be suitable.*
	b.	Is this information related to water?	*All information derived from indicators and other tools should be related to water to show their connections, especially when these are indirect.*		*While the connections to water are mainly indirect, these should be taken into consideration when choosing indicators.*
4.2	a.	Are the increasing complexity of water issues, appropriate policies and actions taken into account so that they become coherent, consistent	*Increasing complexity of water issues, in terms of institutions, increased competition due to population growth, markets, etc., needs to be identified and documented or otherwise made explicit. Existing policies and*	No, increasing complexity of water issues is not recognised in the policy.	*Increasing complexity of water issues is not considered in the policy but should be included.*

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[30] Information targets are indicator points that are set throughout a project to gauge progress that can include quantitative as well as qualitative information concerning targets but also players, processes and structures Westley, F., B. Zimmerman, et al. (2006). Getting to maybe: how the world is changed. Canada, Random House..

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		and easily understood?	*actions need to be outlined and their relationship to each other as well as to the assessed items explained clearly. An understandable picture of the overall situation should be created that shows how all parts work together, identifying inconsistencies so they can be addressed.* *Findings from 4.1 form the basis for this.*		
5		**Ongoing Responsiveness and Efficiency**			
5.1	a.	Do institutions and processes serve all stakeholders, including water?	*It is important that institutions and processes do not exclude any stakeholders either by design or inadvertence; they need to be inclusive (see also 2.1)ensuring that water is considered as a 'stakeholder' with reluctant parties also being identified and included as far as possible.*	The intention of the policy is to improve the mental health situation of children and young people as well as their carers in WA and processes are envisaged to be designed accordingly. The benefits to service providers and other stakeholders is less clear, although all are intended to be involved in key processes (see also 2.1) and the intention to increase resources and capacity is there. Water is not considered.	*The policy envisages that processes and institutions are adjusted to better serve all stakeholders and that they are included in key processes in the system. Water should be included as a stakeholder.*
	b.	Are institutions and processes responsive to change and uncertainty with particular attention to water?	*Ongoing monitoring and review needs to be ensured (through expertise, finances, administration, processes, etc.) and new insights and knowledge need to be incorporated on an ongoing basis to effectively deal with change and uncertainty (e.g. Pahl-Wostl, Sendzimir et al. 2007) (see also 5.1.1 and 5.1.2). This*	The policy explicitly states the use of flexible models of service delivery and continuous quality improvement through systematic and timely data collection, analysis and feedback (p.21). Services and purpose-built facilities will be planned with the capacity to expand and change with changing needs (p.14). No attention is given to water.	*Flexible models of service delivery and ongoing quality improvement are outlined, while capacity for expansion and change is planned for services and facilities. There could be more detail about how uncertainty is being dealt with. Also, all forms and values of water should be considered.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			needs to occur with particular attention to water in its direct and indirect guises, ensuring that no important issue is overlooked or under attended.		
5.1.1	a.	Does the capacity exist to determine trends through measurements that are iterative, adaptive and repetitive?	*The capacity to undertake regular review and analysis of trends as well as making the necessary adaptations needs to be provided. This requires adequate human, financial and procedural resources.*	Data are systematically collected and feedback is provided in a timely manner for continuous quality improvement (p.22). The CAMHS may provide more detail.	*There is provision for systematic data collection and feedback, but more detail should be provided about the nature of the data and the frequency of their collection. It should be made clear if the CAMHS provides such detail.*
	b.	Do the measurements show the effects on the water system?	*Measurements should be made with their relevance to the water system in mind; highly relevant ones should be preferred if possible and appropriate, depending on the context; if the measures relate indirectly to water only this may be more difficult.*	The effects on the water system are not shown.	*Measurements should also be able to show effects, even if they are only indirect, on the water system.*
5.1.2	a.	Is there commitment to ongoing review of performance?	*Performance review is a standard process in a responsible institution or organisation. It makes review meaningful, especially if findings are translated into useful adaptation and change; this should occur with particular emphasis on water and* Water Centrality.	Yes, section 8.7 talks about continuous quality improvement that entails monitoring and evaluation of mental health services (p.21/2); details are provided in the CAMHS. Water and water centrality are not part of this.	*Ongoing performance review is provided for with the aim of ongoing quality improvement, however, there should be more detail on the type of performance measures used. It should be made clear if the* CAMHS *provides for this. Performance review should also relate to progress in* Water Centrality.
	b.	Are goals, frameworks,	*New knowledge, particularly that related to water, needs to be*	No explicit mention is made in the policy; the CAMHS may provide details. Water is not	*The document should outline review or adjustment processes in case of*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		processes and indicators adjustable in light of new insights and emergence of traditional knowledge with emphasis on water?	*distributed and incorporated where applicable so that changes can be made as appropriate. This has to be ongoing and enshrined in review processes.*	mentioned.	*new insights and emergence of knowledge. While reference to continuous quality improvement and dissemination of research outcomes is made, the detail could be improved, or reference made to plans or other documents that provide details, e.g. the CAMHS. Review and adjustments should also take water into account as a matter of course.*
5.1.3	a.	Is feedback on decision making encouraged with particular attention to water?	*Feedback ensures that problems with decisions are detected before they escalate. Changes can be made if appropriate and ultimately acceptability of decisions and outcomes to stakeholders can be increased. Particular attention should be on water.*	There is no specific reference to feedback on decision making, although this could be part of the partnership approach that involves consumers in policy making, planning, priority setting and evaluation of the system. Water is not specifically addressed.	*Involvement of consumers in policy making, planning, priority setting and evaluation as envisioned in the policy may allow for feedback on decision making but this should be described more clearly. Water should be considered throughout.*
5.2	a.	Is collective learning and its development promoted?	*Collective learning is not only based on review but entails active seeking of new ways of doing and new and hidden or obscured knowledge (e.g. Pahl-Wostl, Sendzimir et al. 2007).*	Collective learning is not specifically mentioned, although the promotion of a learning culture is envisaged for specialist services (p.23). There are provisions for ongoing research according to a collectively set research agenda (p. 19) and increased training and education at all levels of service provision (section 8.8). Appropriate educational information for children and their families and the broader community (p.21).	*Collaboration in setting the research agenda is a good basis for collective learning but should be supported by more than dissemination of educational material and research findings. Further collaboration in other areas and with other participants should be explored.*
	b.	Is collective learning emphasising and relating to water?	*Any learning should be related to and emphasise the connections to water to promote awareness of*		*Collective learning should include issues of water and its relationships and connections to mental health*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
			Water Centrality *and water relationships (see e.g. Centre for Ecoliteracy 2000).*		*and health care.*
5.2.1	a.	Is there commitment to ongoing search for new, traditional and indigenous knowledge?	*The discovery of knowledge needs to be supported on an ongoing basis to ensure long-term increase of knowledge which allows for the best possible decisions to be made.*	In section 8.7 a section is specifically dedicated to research. Strategies will be developed that increase the knowledge, understanding and awareness of issues related to mental health (p.21).	*Commitment to ongoing search for knowledge is supported, especially through research and involvement of traditional indigenous healers.*
	b.	Is the ongoing search for knowledge emphasising water?	*Water-related knowledge and the knowledge of water relationships are particularly pertinent to* Water Centrality *and should be fostered specifically.*	Water-related knowledge is not part of the policy.	*There should be an ongoing search for water knowledge related to mental health, direct and indirect aspects.*
5.3	a.	Are decisions made with the aim of achieving economic efficiency, ecological effectiveness and a functional water system?	*It is important to meet the needs of stakeholders and users while making the best use of available resources (which are usually limited) and doing the least possible harm to the environment and the water system in the process.*	Rational decision making concerning resource allocation (p.22). Ecological effectiveness is not mentioned or implied, nor is a functional water system.	*While rational decision making is highlighted for resource allocation the policy should also include other economic elements, ecological concerns and issues of water system function, which are not addressed.*
6		**Institutional and Community[31] Capacity**			
6.1	a.	Is ongoing support in the decision making process provided?	*Guidance for decision making should be provided to organisations and individuals as appropriate to ensure that well informed, practical and*	Provision of educational information is intended to help families make informed decisions (p.21). Ongoing data collection, interpretation and feedback of the quality and effectiveness of the mental health services is provided, which allows for continuous	*Decision making support is provided at several levels. Families are provided with appropriate educational information; ongoing data collection allows for feedback*

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[31] A community can be a group of people that is associated with a geographic area or similar interest, but beyond that communities are social actors, they often share a sense of place, an identity and a set of values, build social capital (built on trust, mutuality and identity), are organised, equitable, adaptable to change, require accountability among others Adams, D. and M. Hess (2001) Community in public policy: fad or foundation? *Australian Journal of Public Administration* **60**, 13-23 DOI: 10.1111/1467-8500.00205.

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			reasonable decisions are made that suit the situation. Support also includes appropriate human and other resources and capacity.	quality improvement, evaluation of service effectiveness and rational decision making regarding resource allocation (p.22). Education and training for health professionals is being increased as is support for service providers through various forms of clinical supervision (section 8.8).	*that can be used in decision making for service quality and effectiveness; increased training and support assists service providers in client-related decision making.*
	b.	Is ongoing decision support highlighting water?	*Any decision support should ensure that water is considered, directly or indirectly, as appropriate.*	No reference is made to water.	*All these aspects should be related to water and include consideration of water.*
6.2	a.	Is institutional capacity for data collection, maintenance and documentation as well as for auditing these provided?	*Basic prerequisites such as facilities, training, human and financial resources as well as processes need to be available on an ongoing basis (see also 6.3).*	Data are systematically collected, recorded, scored, interpreted and fed back to consumers, clinicians, managers, administrators and policy makers (p.22). The CAMHS may provide details.	*While data collection, recording, interpretation and feedback are specified, clarification is required on the provision of institutional capacity to do so. In addition, details should be provided on who is responsible for documenting and auditing these records and how this is done. Reference to the CAMHS should be made if this is appropriate.*
	b.	Is institutional capacity for data collection, maintenance, documentation and auditing appropriate for water?	*Facilities, training, human and financial resources as well as processes need to be designed so that water issues are considered throughout and as appropriate for direct and indirect water issues.*	• Water is not considered.	*All these elements need to be related to water and be designed with water in mind.*
6.3	a.	Is there commitment to ongoing institutional capacity building and	*Mechanisms need to be in place that ensure ongoing review and renewal in the face of new information and knowledge but*	Section 8.7 outlines the commitment to service quality improvement.	*While service quality improvement mechanisms are outlined that refer to research, knowledge and education of service providers (see*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		modernisation or renewal?	*institutions also need to actively seek learning and progress to ensure that the needs of stakeholders and users are met on an ongoing basis. The principles of social learning may be usefully employed (e.g. Pahl-Wostl, Sendzimir et al. 2007).*		*also 5.2 and 5.2.1) as well as facilities, clarity could be improved regarding some of these measures, which appear to be once-off rather than ongoing. There should also be details on ongoing capacity building, modernisation and renewal of the DoH itself.*
	b.	Is institutional capacity building and modernisation or renewal done with keeping water in mind?	*All capacity building and renewal or updates should occur in a manner that emphasises water and its central role as well as all its relationships, hence the mechanisms mentioned under 6.3.1 should cater for water and ensure that it is considered.*	Water is not considered.	*Any institutional capacity building or renewal measures should ensure that water is considered.*
6.4	a.	Is community capacity building enabled, supported and facilitated?	*Community capacity relates to informal or organised interactions of people and resources existing within a community that aid in problem solving, provide the basis to adapt to change and maintain wellbeing (Goodman, Speers et al. 1998; Chaskin 2006). It is also called community development and refers to local empowerment and the ability of communities to help themselves, which depends on strong social cohesion and low incidence of social problems as well as development of self*	Promotion of mental health and prevention of mental health issues (section 8.4) Appropriate educational information for children, young people, their families and the broader community will be provided to assist families make informed decisions, seek appropriate help and reduce the stigma surrounding mental illness or help seeking (p.21). Improvement of family support and treatment services that are "designed to provide a wide array of services to assist families by meeting their emotional, social and other basic needs. The aim is to reduce family stress and	*Community capacity building may be inherent in the formation of effective partnerships with families and communities that is part of the State Mental Health Promotion and Illness Prevention Strategy, which is referred to in the policy but without details. Provision of educational material for young people, families and the broader community are intended to increase knowledge and awareness and provide decision support.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			esteem, confidence, self-reliance and decision-making power (Department for Community Development 2005). Local initiatives need institutional and government support as well as resources, which include appropriate structures and processes (see also sections 2, 5, and 7) as well as those elements under 6.1-3 and 6.5. Social learning may also be useful in this context (e.g. Pahl-Wostl, Sendzimir et al. 2007). Water should be a central consideration in all these activities, highlighting the role of water in these and fostering (the awareness of) relationships with water.	enhance the family's ability to care for their children at home. Services will be committed to supporting family functioning and helping families cope with a child who has a mental health problem." (p.vi Appendix Two)	
7.4.1	a.	*Community development* Is capacity for participation and leadership developed and fostered?		There is no specific mention of community leader development	*Issues of community leadership and skills development and provision of resources for community development should be addressed.*
	b.	Is skills development supported?		Skills development is not specifically supported in a community context	*See 6.4.a.*
	c.	Are resources provided (financial, social and technical) and is their prudent use ensured?		There is no specific reference to resource provision for community capacity except for educational material (p. 21) and reference to maximisation of client decision making through improvement of emergency services (p.iii Appendix Two)	*See 6.4.a.*
	d.	Are social and inter-organisational networks fostered?		The DoH is working with other relevant agencies to improve the delivery of mental health services to children and youth, and mental health services take the lead to develop an integrated system of care with other relevant service providers and professionals (section 8.1). Partnerships with families, carers and consumers at the systems level are mentioned (p.19).	*While the integrated system of mental health services is outlined well and in detail, the nature of partnerships with families and consumers at the system level should be specified.*
	e.	Is the development of self-esteem, confidence, self-reliance and decision-making power supported?		Appropriate educational information to assist families make informed decisions, seek appropriate help and reduce the stigma surrounding mental illness or help seeking (p.21).	*Yes, there is intention to increase decision-making power through education and by provision of better emergency services. This could be broadened and increase in self-esteem and confidence could be*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
				Improvement of emergency services to help maximise client decision making as well as carer and family involvement (p.iii Appendix Two)	*supported more explicitly.*
	f.	Is a sense of community promoted?		An intention is the reduction of the stigma surrounding mental illness (p.21).	*Reducing the stigma surrounding mental health may be useful in promoting a sense of community, although the latter is not specifically pursued by the policy.*
	g.	Are all these efforts undertaken with water in mind or a focus on water?		Water is not mentioned.	*Any community development and capacity building should ensure that water is considered.*
6.5	a.	Are institutions able to deal with all forms of water?	*Institutions are often set up to deal with blue (liquid) water or waste water or sewage but have limited capacity to deal with green water, grey water (household waste water except toilet waste), black water (toilet waste),water vapour or virtual water (indirect water transfer through produce trade). This is true for formal[32] as well as informal institutions. The complexities of interconnectivities between these forms of water also need to be addressed as appropriate.*	Water is not mentioned in the policy.	*Although institutions related to youth mental health are not specifically set up to deal with water in any form (except for that used in their premises by employees), they should be able to deal with some of the values of water such as those related to physical and mental health and perhaps take responsibility for water pollution caused by prescription of pharmaceuticals. Broader concerns of livelihood and water shortages, as well as climate change, that all depend on water should also be considered, at least insofar as they can have effects on mental health.*

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[32] Formal institutions are those set up in a formalised way, such as government departments, educational institutions or banks. Informal institutions are those that are not formally organised such as culturally based interest groups, although some of these, such as religious organisations, may also be formalised.

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
7		**Transparency, Accessibility and Accountability**			
7.1	a.	Is information distributed freely within society?	*Information needs to be easily accessible and distributed actively throughout society, including to disadvantaged and less interested members. There need to be provisions and mechanisms for this to occur, e.g. good media exposure, distribution of written and other information, internet presence.*	• Whole of community approach to promotion of mental health and prevention of mental illness (see associated policy) (section 8.4). • Educational information is provided to the broader community (p.21). • Outcome measurement data is interpreted and fed back in appropriate form to consumers, clinicians, managers, administrators and policy makers (p.22). • Improved dissemination of information and knowledge through online technology; as a minimum, specialist mental health services should have access to telepsychiatry systems and library and internet services (p.20).	*Information on mental health promotion and illness prevention is intended for the whole community while improved access to specialist information is envisaged for service providers throughout the country including remote areas. Presumably, this information is distributed freely, but this could be clarified.*
	b.	Is this information accenting water?	*The tenet of* Water Centrality *should be supported by emphasising water and its relationships wherever possible to increase water literacy; it should become a matter of course.*	No water information is provided.	*Information on water, its relationships to mental health and* vice versa *should be made available to foster water literacy.*
7.1.1	a.	Are processes, institutions, methods data and information available and accessible to all?	*Institutions need to be contactable and accessible, in person and via phone and electronic means as well as with regard to structure and processes. The latter should be transparent, appropriate and uncomplicated. Data, information and methods need to be freely*	• See 7.1.a. • Outcome measurement data is interpreted and fed back in appropriate form to consumers, clinicians, managers, administrators and policy makers (p.22). • Improved dissemination of information and knowledge through online	*The aim of the policy is to improve access to services and information to all those who want and need it. Data and feedback is provided in appropriate form to all interested parties.*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			available to all interested parties. They need to be understandable and in a format that is accessible to all stakeholders and useful for decision makers (e.g. Dietz, Ostrom et al. 2003). It also means that information needs to be available in different forms (e.g. print, radio, TV, and internet) since not everyone can read or has a TV, buys a newspaper or has internet access.	technology; as a minimum, specialist mental health services should have access to telepsychiatry systems and library and internet services (p.20). • Educational information is provided to the broader community (p.21). Services will be community based and regionally coordinated using flexible models of service delivery (p.21). • Appropriate educational information for children, their families and the broader community (see also 5.2).	
7.1.2	a.	Are all processes and decisions transparent and open to public scrutiny?	*It needs to be obvious and apparent which processes are applied, how they work and how they are used. It also needs to be clear how decisions are made and what the outcomes are. There need to be provisions for review and feedback (see also 5.1.3).*	• Family involvement in policy making, planning, priority setting and evaluation of the whole system of care (p.19). • Timely feedback in appropriate form is provided to consumers, clinicians, managers, administrators and policy makers for data that are systematically recorded, scored and interpreted (p.22). • Funding transparency of the mental health programme (p.24).	*The policy could be clearer about how transparency and openness of processes and decision making is ensured. This includes the outlined family involvement in planning, priority setting and system evaluation, provision of feedback on data collected for the purposes of quality assurance (in this case the data is interpreted and presented in appropriate form, which should be clarified) and funding transparency. Many processes that are alluded to should be specified or reference made to where the appropriate information can be found.*
	b.	Do all processes and decisions take water into account?	*Water needs to be considered in all processes and in each decision; this may be in the form of an extra clause or set of*	Water is not part of the policy.	*All processes and decisions should take water into account; various forms of decision support may be thinkable, e.g. a set of questions or a*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
			questions or, ideally, should be built in or even focus on water.		*short version of the WCI.*
7.1.3	a.	Are all judgements, assumptions and uncertainties in data and interpretations being made explicit highlighting what this means for water?	*All judgements, assumptions and uncertainties need to be revealed to reduce surprises, hidden agendas and the potential for corruption. This needs to be considered with regard to 4.1-whole system review and should highlight the potential and actual effects on the water system.*	Uncertainty in the data about CALD is referred to (section 8.6). No explicit explanation of how the outcome measurement data are scored and interpreted before feedback is given to stakeholders. The CAMHS may provide detail (p.22). Effects on the water system are not considered.	*More detail should be provided on how the outcome measurement data that are collected are scored and interpreted before feedback is provided to stakeholders. If the CAMHS provides these details it should be mentioned. Some detail about how judgements, assumptions and uncertainties are dealt with and how effects on the water system are considered should be provided.*
7.2	a.	Are documents, processes and institutions designed to address the needs of the audience and users?	*Documents produced by and processes used in all institutions need to be understandable and user friendly. They also need to be relevant and appropriate to the audience, the process or institution in question. The institutions themselves need to be accessible and relevant, avoiding duplication or unnecessary complexity.*	4-tiered system of service provision with families and carers as priority (section 8.1). Provision of comprehensive specialist mental health services for children and young people through enhanced capacity, training and support for service providers (section 8.2) Regionally planned and community based services are developed (section 8.3). Enhancing promotion and prevention (section 8.4), developing rural and remote services (section 8.5) and responding to cultural diversity (section 8.6). Improvement of service quality (section 8.7) and increase of training and education (section 8.8). All the above include processes and institutional design aimed at improving mental health services for youngsters in WA through better structures and processes. Appropriate educational information for children, young people, their families and the broader	*Much of the policy outlines changes to the youth mental health system that are aimed at improving the processes, capacities and facilities of the system with users and clients in mind. Educational documents as well as feedback on outcome measures are supposed to be designed for different users. While the intentions seem to indicate that documents, processes and institutions should be user friendly, accessible and relevant this would need to be verified in practice.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls → Improvements*
				community will be provided to assist families make informed decisions, seek appropriate help and reduce the stigma surrounding mental illness and help seeking (p.21). Establishment of flexible models of service delivery, linkages between mental health and other services, better access to services, reduced waiting times, culturally competent services and clear communication (p.21). Data is fed back in appropriate form to consumers, clinicians, managers, administrators and policy makers (p.22).	
	b.	Are documents, processes and institutions designed to address the needs of water?	*Documents and processes should be well thought-out, relating to and emphasising the roles and values of water. The institutions themselves should be designed with water in mind; conceptually, water could be used as a role model to set up processes and other elements, e.g. information flows and data pools; physically, buildings and settings should cater for water through appropriate setting, architecture, building methods and materials, interior design, infrastructure, etc.*	The needs of water are not addressed.	*All institutions and processes should be designed with water in mind, conceptually and physically.*
7.2.1	a.	Is the structure simple and is clear and plain language used that features	*The structure of documents and processes should be uncomplicated and unambiguous to enable ease of reading and use,*	The structure of the document is relatively simple and straightforward; the language is understandable with little jargon (a 1-page glossary explains some more complex terms); no water metaphors are used.	*The document could be improved with a better structure, use of dot point lists and tables, diagrams and cross-referencing. A summary of the*

		Water Centrality Questions	Expectations	Assessment (how is it done?)	Shortfalls → Improvements
		water?	*for understanding without hidden meanings – flow and clarity. The language used must be plain and clear, using water metaphors where appropriate, with as little jargon as possible, for everyone to understand. Using water metaphors where appropriate enhances water awareness.*		*CAMHS would be advantageous. The language is clear and plain with little jargon used, but could use more water metaphors to emphasise the centrality of water for mental health.*
7.3	a.	Are government, private sector and civil society organisations accountable to the public and the interests they represent including the water system?	*Some form of public review or accountability process should be in place (e.g. such bodies as the Auditor General, the Ombudsman or the Senate Estimates Committee could be utilised/adapted) to ensure that organisations actually deliver what they are supposed to and that the possibility for corruption is minimised. Such system should have a focus on water in all its forms, ensuring that the water system is represented and considered always.*	Outcome measures are collected and used of ongoing quality improvement (p.22). Evaluation is used (section 8.8). All service providers are accountable to ensure full programme integrity (p.24); it is unclear how far the Department of Health itself is implicated. Water is not part of these considerations.	*Although evaluation is stipulated as part of service provision and continual quality improvement, accountability is only specified for programme providers in terms of resources. More information should be provided on how quality improvements are ensured and shortcomings are addressed, and how this is done for all the forms and values of water.*
7.4	a.	Are responsibilities assigned clearly with accent on water?	*Responsibilities need to be allocated to the organisation(s), person(s) or institution(s) that can best deal with particular elements of the water system so that good outcomes are ensured. All roles need to be well defined and supported (see 6.3) and need to*	Services will be predominantly community based with management and decision making responsibilities resting at the regional level (p.6). Responsibilities of the 4 tiers of mental health services are outlined in figure 2, section 8.1, while further roles and responsibilities of relevant agencies and services will be outlined in the regional plans (p.13).	*Responsibilities are clearly assigned or should be in the regional plans, but water is completely neglected. This should be remedied to ensure that water is looked after in the best possible way.*

		Water Centrality Questions	*Expectations*	*Assessment (how is it done?)*	*Shortfalls* → *Improvements*
			include conflict management and resolution mechanisms (see e.g. Dietz, Ostrom et al. 2003)	Responsibility towards water is not mentioned.	

Appendix E

Waterbookmark[33]

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[33] Printing the *Waterbookmark* for use with the thesis requires copying the page to a new document, removing the page number and reformatting it to A5 size or folding the A4 sheet.

Water Centrality Principles - short version

Quick reference for use with Ute Goeft's PhD Thesis; full version on p.159 &171

1	**Strategic Vision**
1.1	Clear, broad, long-term, water central vision
1.2	Ethical, water central approach
1.3	Broad consensus for best interest of group, policies and procedures
2	**Participation and Voice**
2.1	All affected and interested parties have a voice and are represented
2.1.1	*Freedom of association and speech and capacity to participate*
2.1.2	*Inclusion of decision makers to secure link between policy and action*
3	**Equity and Fairness**
3.1	Central role of water for ecological conditions for life considered for equity
3.1.1	*Adequate access to water for all life to improve wellbeing*
3.1.2	*Equity/disparity in and between current and future generations*
4	**Integration and Coherency**
4.1	Review of the whole system, its parts and interactions
4.1.1	*Wellbeing of soc, ecol and econ subsystems and their interactions*
4.1.2	*Positive and negative consequences of human activity in $ and non-$*
4.1.3	*Ecosystem service & non-market activity contribution to human/social*
4.1.4	*Time frames*
4.1.5	*Spatial scales*
4.1.6	*Historic and current conditions*
4.1.7	*Organising framework*
4.1.7.1	*Limited number of key issues*
4.1.7.2	*Limited number of indicators*
4.1.7.3	*Measurement standardisation*
4.1.7.4	*Comparison of indicator values to targets*
4.1.8	*Info from indicators that stimulate and engage decision makers*
4.2	Complexity of water resources considered
5	**Ongoing Responsiveness and Efficiency**
5.1	Institutions and processes serve all stakeholders and are responsive to
5.1.1	*Capacity for iterative, adaptive and repeated measures to determine*
5.1.2	*Ongoing performance review & adjustments in light of new knowledge*
5.1.3	*Feedback on decision making*
5.2	Collective learning is promoted
5.2.1	*Ongoing search for knowledge*
5.3	Decisions are made to achieve economic efficiency and ecological
6	**Institutional and Community Capacity**
6.1	Ongoing decision making support
6.2	Institutional capacity for data collection, maintenance and documentation
6.3	Ongoing institutional capacity building and renewal
6.4	Community capacity building
6.5	Institutions are able to deal with all forms of water
7	**Transparency, Accessibility and Accountability**
7.1	Free information flow and diffusion
7.1.1	*Processes, institutions, methods, data and information are accessible to*
7.1.2	*Processes and decisions are transparent and open to scrutiny*
7.1.3	*Judgements and assumptions are made explicit*
7.2	Documents, processes and institutions address needs of audience and users
7.2.1	*Use of simple and clear language and structure*
7.3	Government, private sector and civil society organisations are accountable
7.4	Clear assignment of responsibilities

Acronyms and Abbreviations
used in Ute Goeft's PhD thesis

ABS	Australian Bureau of Statistics
ASARECA	Association for Strengthening Agricultural Research in Eastern & Central Africa
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CALD	children from culturally and linguistically diverse backgrounds
COAG	Council of Australian Governments
CSD	Commission on Sustainable Development (United Nations)
CWSM	community-oriented watershed management
DoH	Department of Health (Western Australia)
DoW	Department of Water (Western Australia)
EPA	Environmental Protection Authority
ESD	Ecologically Sustainable Development
EV	Environmental Values
EWP	environmental water provisions
EWR	ecological water requirements
GBI	Green-Blue Initiative
GDE	Groundwater dependent ecosystems
GWP	Global Water Partnership
HELP	hydrology, environment, life, policy (UNESCO)
ICM	integrated catchment management
IRBM	integrated river basin management
IRM	integrated resource management
IUCN	International Union for Conservation of Nature and Natural Resources – The World Conservation Union
IWM	integrated water management; integrated watershed management
IWMI	International Water Management Institute
IWRDM	integrated water resources development and management
IWRM	integrated water resource management
JPOI	Johannesburg Plan of Implementation
MEA	Millennium Ecosystem Assessment
NRM	natural resource management
NSESD	National Strategy for Ecologically Sustainable Development
NWI	Intergovernmental Agreement on a National Water Initiative
NWQMS	National Water Quality Management Strategy
SD	sustainable development
SDT	Self-Determination Theory
SEEAW	System of Economic and Environmental Accounting for Water
SIWI	Stockholm International Water Institute
SWR	social water requirements
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VWF	Virtual Water Forum
WBCSD	World Business Council on Sustainable Development
WCC	*Water Centrality* Charter
WCI	*Water Centrality* Instrument
WCP	*Water Centrality* Principles
WDE	water dependent ecosystems
WEHAB	water, energy, health, agriculture and biodiversity
WHYMAP	World-wide Hydrogeological Mapping and Assessment Programme
WHO	World Health Organisation
WMO	World Meteorological Organisation
WRC	Water and Rivers Commission (absorbed by DoW and DEC in 2005)
WRM	water resource management
WSSD	World Summit on Sustainable Development
WWAP	World Water Assessment Programme (UN)
WWV	World Water Vision

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