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Water Governance in a Comparative Perspective: From IWRM to a 'Nexus' Approach?

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ABSTRACT: Nexus thinking, in the form of integrating water security with agriculture, energy and climate concerns, is normatively argued to help better transition societies towards greener economies and the wider goal of sustainable development. Yet several issues emerge from the current debate surrounding this concept, namely the extent to which such conceptualisations are genuinely novel, whether they complement (or are replacing) existing environmental governance approaches and how – if deemed normatively desirable – the nexus can be enhanced in national contexts. This paper therefore reviews the burgeoning nexus literature to determine some common indicative criteria before examining its implementation in practice vis-à-vis more established integrated water resources management (IWRM) models. Evidence from two divergent national contexts, the UK and Bangladesh, suggests that the nexus has not usurped IWRM, while integration between water, energy, climate and agricultural policy objectives is generally limited. Scope for greater merging of nexus thinking within IWRM is then discussed.

KEYWORDS: Nexus, integrated water resources management (IWRM), water governance, energy, agriculture

INTRODUCTION

Water, energy, climate and food security, and the natural resources that determine them, are inextricably linked (Olsson, 2013). Some scholars and policy makers have argued that integrating these concerns within a 'nexus' approach can better transition societies towards a green economy and hence wider sustainability (see Hoff, 2011). Although, problematically, definitions vary, one critical normative condition for effective nexus approaches is held to be identifying cross-sectoral, multi-scale policy interdependencies that reduce mismatches in policy making, increase synergies, and hence promote resource security (WEF, 2011; Bizikova et al., 2013). Within such an approach, water security is argued to be "at the heart of social, economic and political issues" such as agriculture, energy production and human livelihoods (WEF, 2011: 3). Despite empirical evidence that nexus principles are permeating policy responses globally (for example, Scott et al., 2011), it remains questionable this marks a divergence from pre-existing governance approaches. For this to be occurring, the nexus should be strongly complementing or even replacing established environmental governance concepts. Integrated water resources management (IWRM), for example, is an umbrella concept encompassing multiple principles which, overall, also aim at more holistic and coordinated management between different

aspects of water resource systems (Conca, 2006; Gain et al., 2013a; Benson et al., 2013a). The IWRM and nexus approaches therefore appear closely related but differ in certain aspects. The ultimate objectives of both are to promote better resource use to allow societies to develop in environmentally, socially and economically sustainable ways. However, without comparative evidence of these two approaches in practice, their extent and influence are difficult to judge.

In this respect, the paper will examine several pertinent questions for those engaged in nexus research. Firstly, what is new about the nexus that did not exist in common knowledge? We therefore initially provide a critical review of the emerging nexus literature, to identify its central arguments, concepts and principles to provide better conceptual clarity and distinguish the approach from other pre-existing environmental governance concepts, most notably IWRM (Section 2). This paper hence contributes to this literature by providing a new conceptual-analytical reference point. Secondly, to what extent is such nexus thinking complementing, or even replacing IWRM? In Section 3, this conceptual framework is utilised to examine the nexus and IWRM implementation in two divergent national cases, namely the UK (England and Wales) and Bangladesh. We test the extent to which the nexus has permeated national responses by providing a comparison between this developed and developing country context. Our research draws upon extensive research into governance from each national context (Benson and Jordan, 2008; Gain and Schwab, 2012; Gain et al., 2012; Spray and Rouillard, 2012; Fritsch and Benson, 2013; Rouillard et al., 2014). Section 4 then discusses the implications of the findings in terms of whether the nexus is challenging the dominance of IWRM. Our conclusions then reflect back on our research questions but also examine another, namely whether normative policy recommendations can be made from the analysis for enhancing the nexus in national contexts.

DECONSTRUCTING (AND RECONSTRUCTING) THE NEXUS CONCEPT

Water, energy, climate and food security are self-evidently closely related – but what exactly is meant by the nexus? While the nexus is often presented as the integration of multiple sectoral elements such as energy, climate, water and food production within an overarching governance approach, there appears little agreement on its precise meaning. The literature reveals a multiplicity of competing, and often overlapping, conceptions with limited discussion of definitions; suggesting an urgent need to establish some common themes for comparative analysis. Without clearly specified concepts, researchers risk the so-called 'travelling problem' (Sartori, 1970; Benson et al., 2013b), whereby comparing differing conceptualisations uncritically across national contexts can produce imprecise conclusions, i.e. researchers are not comparing like-for-like. Our review therefore employs several critical indicators underpinning current debates to help reduce conceptual imprecision – or at least inform a productive definitional debate – namely: *policy integration*; *governance*; *scale*; *participation*; *resource efficiency* and *sustainable development*. While these indicators are themselves contestable, they nonetheless have informed comparative prior analyses of IWRM (Gain et al., 2013a; Rouillard et al., 2014). Some of these characteristics could therefore help distinguish the nexus from IWRM. We therefore initially trace the establishment of IWRM and explore the emergence of nexus thinking within this context. We then systematically compare IWRM indicators with key dimensions in nexus arguments.

A historical perspective

Despite the apparent 'newness' of the nexus concept, elements of this approach are historically evident. Molle (2009) shows how the integration of water resources management at river basin scales dates back many decades and involves several semi-distinct paradigmatic changes. One early example of a recognisable nexus form is the Tennessee Valley Authority (TVA), created in 1933 (Andrews, 2006). Here, a US federal government agency was created to holistically manage water resources while

generating energy, supporting agriculture and promoting wider socio-economic development. Such integrated water management then became the blueprint for developing countries "as large-scale water engineering projects became a means to drive national development strategies" (Gain et al., 2013a: 12). Beginning in the 1940s, this notion spread as "TVA-like river-basin development plans mushroomed all over the world" (Molle, 2009: 489), particularly in Asia, Africa and South America. This approach was overtly engineering based and development-oriented (Gain et al., 2013a). Thereafter, the late 1970s to the early 1990s was characterised by "a certain demise and loss of appeal of the river-basin concept" (Molle, 2009: 490), leading to new thinking. Attempts were made to regulate emerging point source water pollution problems through legislation, for example the US Clean Water Act amendments of 1972 and European Economic Community water directives (Benson et al., 2013a). But the failure of 'command and control' centralised approaches to counter diffuse water pollution stimulated demands for more integrated river basin management. Locally collaborative 'watershed' management emerged during the 1980s in the USA in response (Sabatier et al., 2005).

A growing perception developed amongst water professionals globally that a new paradigm was required to better reflect the multidimensional nature of water management (Biswas 2008a). By the early 1990s, these views had been formalised into IWRM – although in reality, it merely updated pre-existing integrated approaches with an emphasis on sustainable development through the inclusion of environmental protection, participation, efficiency and equity (ibid). Codification of IWRM via a set of universal principles came in 1992 at the UN/World Meteorological Organization Dublin Conference. These principles prioritise water as a finite resource, promote stakeholder participation of stakeholders and treat water as an economically valuable good (WMO 1992). The Dublin Principles subsequently proved highly influential through their promotion by international organisations such as the World Water Partnership, the World Bank and the Global Water Partnership (GWP).¹ The UN then adopted IWRM as part of its Millennium Development Goals, while some of the principles were incorporated into the European Union's Water Framework Directive (2000). The Directive mandates that EU member states introduce river basin management planning for sustainable water quality, although it is also integrating climate adaptation (Fritsch and Benson, 2013). Expansion of IWRM, however, has since been evident globally with examples visible in many developing countries (see for example, Maganga et al., 2004; Rahaman and Varis, 2005; Sokolov, 2006; Funke et al., 2007; García, 2008; Biswas, 2008b; Gallego-Ayala and Juárez, 2011; Agyenim and Gupta, 2012; Beveridge and Monsees, 2012; Gallego-Ayala, 2013; Dukhovny et al., 2013).

Integrated water management has therefore undergone several interconnected shifts, resulting in the current IWRM paradigm. Demands for new approaches, however, emerged in the 2000s. One significant change has been the movement towards adaptive water management (AWM), which emerged in the USA and Australia. Adaptive management (AM) refers to a systematic process for continually improving management practices (Holling, 1978; Pahl-Wostl, 2007; Pahl-Wostl et al., 2007; Engle et al., 2011). As such, AM involves 'learning by doing': using feedback mechanisms from the environment (biophysical and/or social) to shape policy, followed by further systematic experimentation, in a never-ending cycle (Walters and Holling, 1990; Berkes et al., 2002; Allen et al., 2011). Adaptive Water Management also features stakeholder input and knowledge generation, objectives setting, management planning, monitoring implementation and incremental plan adjustment in the face of uncertainty (Pahl-Wostl, 2007; Pahl-Wostl et al., 2008; Huitema et al., 2009; Engle et al., 2011).

¹ The GWP endorses the Dublin Principles and promotes IWRM via river-basin-scale management, optimising supply through assessments of water resources, demand management through cost recovery, providing equitable access to water, establishing policy frameworks and norms, and inter-sectoral approaches that incorporate multiple stakeholders, including women (GWP, 2010).

Another more recent development has occurred in response to global food and economic crises. The Water-Energy-Food (WEF) Nexus (Bazilian et al., 2011; Hoff, 2011; ICIMOD, 2012) acknowledges the links between water, energy and food resources in management, planning and implementation (Bach et al., 2012). As the world population hurtles towards 8 billion, more conscious stewardship of the requisite resources required has become significant. Instability of food prices linked to climate change events highlighted the general vulnerability of resource production systems and the overexploitation of water in particular. To avert such issues, the 2008 World Economic Forum (WEF) Annual Meeting agreed upon a Call to Action on Water aimed at re-examining the relationship between water and economic growth. Business leaders and policy makers subsequently developed the nexus concept, resulting in the WEF's 2011 report (WEF, 2011), which provides a major source of guidance. The following Bonn 2011 Nexus Conference then became the first internationally recognised event held on the water, energy and food security nexus. The Mekong2Rio Conference then took a step forward in exploring the water, energy and food security nexus in a trans-boundary context, moving from rhetoric to practice (Bach et al., 2012). Subsequent policy dialogues, such as the Bonn 2013 conferences, promotion by the WEF and GWP, and an emerging academic research agenda have sought to finesse nexus thinking, although conceptualisations are still developing. Recently, the European Union along with the German Federal Ministry for Economic Cooperation and Development, the International Food Policy Research Institute, the WWF and the World Economic Forum began heavily promoting the nexus approach to governments. In addition, the WEF nexus was one of the main approaches considered by the United Nations in setting its sustainable development goals (SDGs). Given this high-level support, it could be anticipated that the nexus discourse should be influencing national water governance strategies.

In practice, major differences are apparent in how this discourse is being interpreted. These differences are critically apparent in the empirical foci of nexus research and neologisms employed. By no means exhaustive, these include *inter alia*: the 'water-food-energy-climate nexus' (WEF, 2011; Beck and Villarreal Walker, 2013); the 'water and food nexus' (Mu and Khan, 2009); the 'water-energy nexus' (Scott et al., 2011; see also Perrone et al., 2011; Hussey and Pittock 2012); the 'energy-water nexus' (Marsh and Sharma, 2007; Murphy and Allen, 2011; Stillwell et al., 2011); the 'bioenergy and water nexus' (UNEP, 2011); the 'energy-irrigation nexus' (Shah et al., 2003); 'water-energy-food security nexus' (Bazilian et al., 2011; ICIMOD, 2012; Bizikova et al., 2013; Lawford et al., 2013); and related concepts such as 'land use-climate change-energy nexus' (Dale et al., 2011) and a range of development-related nexus approaches (see Groenfeldt, 2010). The nexus concept is therefore far from unified and seemingly varies according to the focus of sectoral integration studied and the geopolitical context. Some neologisms adopt an energy, climate or food focus but all these sectors are invariably linked to water resource protection. Given this divergence, the next section presents a more systematic comparison of nexus thinking alongside IWRM conceptualisations to draw out some commonalities.

Comparing the nexus to IWRM

How then does the nexus concept differ from other, more established, water management concepts such as IWRM? A general overview would certainly suggest several similarities and also differences around their normative assumptions on *policy integration, optimal governance, scales, stakeholder participation, resource use and sustainable development*.

Firstly, integral to both the nexus and IWRM is integration between water and parallel policy sectors.² A common overriding theme in most nexus studies is integration between water resources security and other intervening policy sectors in management, planning and implementation (see Bach et al., 2012). Hoff (2011), for example, suggests that given the interconnectedness across sectors

² These sectors vary, according to conceptions, but generally include energy, food and climate change.

(water, energy, food, climate), space and time, a reduction of negative economic, social and environmental externalities can increase overall resource use efficiency and sustainability. Indeed, the World Economic Forum (WEF) – the main nexus promoter – views securing water resources as dependent on consideration of multiple sectors, namely energy, trade, national security, cities, people, business, finance, climate and economic frameworks (WEF, 2011). In comparison, IWRM also aims at integrating and coordinating public policies, particularly water management and cognate sectors such as agriculture (Hering and Ingold, 2012; Gain et al., 2013a). A fundamental prerequisite for this integration is coordination between government agencies (Rouillard et al., 2014) and hence government steering of different policy objectives. Two important objectives involve linking social and economic development with natural ecosystems protection, and the optimal allocation of water services (GWP, 2010). However, according to Bach et al. (2012), a critical difference with the nexus is the relative significance attached to sectoral pillars: whereas IWRM tries to engage all sectors from a water management perspective (i.e. water-centric), the nexus approach treats different sectors – water, energy, food and climate security – as equally important (i.e. multi-centric) as its point of departure.

Secondly, both concepts provide guidance on optimal governance. Although contested, governance involves "the patterns that emerge from the governing activities of diverse actors [primarily governments] that can be observed in... acceptable norms of behaviour, and divergent institutional forms" (Adger and Jordan, 2009: 1). Although not overly prescriptive in terms of specific institutions, the nexus does, as discussed, aim at policy coherence (WEF, 2011) alongside multilevel institutional responses. However, as Hussey and Pittock (2012: 31-32) argue, a critical issue with the nexus is "the lack of integration" between energy-water sectors, requiring policy makers to devise "effective policies, processes, and analytical tools that integrate the... nexus... into policy and investment decisions". Integration however, raises 'institutional challenges' with both "opportunities and impediments to joint decision-making" (Scott et al., 2011: 6622). Scott et al. (2011: 6623) describe how the US Federal Energy and Water Research Integration Act 2010 "represents an important national step towards energy-water policy coupling" and also suggest that in reality "[l]ocal-state-federal institutional mechanisms seeking to link energy and water resource management effectively remain decoupled". They argue that because "resource coupling" is played out at different institutional levels, "multi-tiered institutional arrangements" are required to govern it, providing examples from the USA (ibid). However, nexus conceptualisations provide few normative principles on how governance *should* occur. In contrast, IWRM forwards 'good governance' principles such as transparency, collaborative decision-making and the use of specific policy instruments (see Benson et al., 2012; Gain et al., 2013a).

Thirdly, another variance concerns the optimal scale at which interaction is anticipated. As promoted by international agencies and national governments, IWRM is overtly premised on institutional forms at the river basin (hydrological) scale while also providing an overarching centralised approach for national policy (Rouillard et al., 2014). In contrast, the nexus, in its original WEF conception, includes broader macro- or meso-scale norms for integrating policy sectors, i.e. 'policy coherence', between different levels but provides very limited guidance on how this should, normatively, occur. That said, studies have examined the nexus at specific scales, including the river basin, demonstrating its multilevel, holistic nature (Newell et al., 2011; Opperman et al., 2011; Stillwell et al., 2011; Pittock, 2011; Lawford et al., 2013). Scott et al. (2011) also examine both policy and institutional dimensions of the water-energy nexus at national, regional and local scales in the USA.

Fourthly, similarities and differences exist in their respective views on participation. The WEF, reflecting its corporate underpinnings, devotes a whole chapter of its 2011 nexus report to discussing 'innovative water partnerships', which it describes as "public-private coalitions for water sector transformation – the multi-stakeholder platforms that can bring different stakeholders together" (WEF, 2011: 225).

Examples provided by the WEF are pilot public-private partnerships in India, South Africa and Jordan that constituted a learning 'laboratory' for collaborative mechanisms in the water sector (WEF, 2011: 226). Meanwhile, the Bonn 2011 Conference recommended that 'policy coherence' should involve greater cooperation between actors and citizen participation, although it too mentions public-private partnership as an important facilitating mechanism (BMU, 2011: 8). Stakeholder involvement, primarily in the form of local communities and civil society, is also held critical to IWRM but with the participation of non-state actors such as business also prioritised (Gain et al., 2013a). The Dublin Principles, on which IWRM conceptions are often based, identified a role for "users, planners and policy makers at all levels", including women, in "the provision, management and safeguarding of water" (WMO, 1992). This notion has hence come to strongly underpin IWRM worldwide, although stakeholder participation is variable (Gain et al., 2013a).

Fifthly, both concepts refer to efficient resource use, although approaches again differ. The WEF, reflecting its strong business constituency, talks of the nexus in terms of economically rational decision-making (WEF, 2011). Here, they argue for "comprehensive economic analysis" to help decision-makers with water management (ibid: 204). A step-wise process involving several stages is forwarded by the WEF, involving identifying demand and supply gaps over long temporal scales, examining efficiency improvements and technical options for addressing gaps, identifying implementation resources and then introducing suitable incentives. But IWRM also promotes efficiency, water pricing and demand management. The Dublin Principles refer to the need for efficient management and equitable access to water resources (WMO, 1992). The Global Water Partnership, in its IWRM guiding principles, thus refers to managing demand efficiency through a similar process of optimising supply through water resource assessments, using cost recovery and providing equity in access (GWP, 2010). A major difference with the nexus is its stronger emphasis on involving business actors, as mentioned above.

Finally, both the nexus and IWRM concepts are set within a wider context of sustainable development. While a much contested notion (Adger and Jordan, 2009), sustainable development is often understood to mean, paraphrasing the Brundtland 1987 definition, development that meets the needs of present generations while not preventing the ability of future generations to meet their needs (WCED, 1987). Sustainable development became the guiding principle for both the 1992 UN Rio Conference and the follow-up Rio +10 Conference in Johannesburg, where it was defined more as integrating economic, social and environmental objectives. Implementing sustainable development has since posed significant challenges for policy makers worldwide due to its inherent ambiguities and irreducibly normative assumptions. That said, both the nexus and IWRM aim at promoting sustainable development of water resources. Here, securitisation is a critical concern within nexus thinking and consequently features in the WEF (2011: 11) report: "[w]ater security is the gossamer that links together the web of food, energy, climate, economic growth, and human security challenges that the world faces".

Yet 'security' is not readily defined, remaining rather nebulous within nexus thinking. In attempting to address this deficiency, Beck and Villarroel Walker (2013: 627) state that water security concerns "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production". They argue that this perception treats water as "first amongst equals", whereby it is central to the nexus alongside other sectors such as energy and food production (ibid: 626). Sustainable development in IWRM is understood slightly differently, through efficient resource allocation, ensuring equitable access for marginal social groups, avoiding end-of-pipe solutions, using greener approaches, and critically, demand management (Gain et al., 2013a). The GWP, in particular, cites effective demand management as critical to achieving resource efficiencies (see GWP, 2010).

The nexus could therefore be seen as novel, or at least exhibiting some novel elements, which mark a divergence from the IWRM paradigm, particularly in terms of holistically integrating different policy sectors, encouraging business involvement, promoting economically rational decision making and privileging water securitisation in the pursuit of sustainable development (summarised in Table 1). But

to what extent is this approach now actually displacing IWRM? While some evidence exists of uptake of these ideas globally, the actual influence of nexus thinking in water governance remains questionable.

Table 1. Key features of the water security nexus and IWRM.

	Nexus	IWRM
Integration	Integrating water, energy and food policy objectives	Integrating water with other policy objectives
Optimal governance	Integrated policy solutions Multi-tiered institutions	'Good governance' principles
Scale	Multiple scales	River-basin scale
Participation	Public-private partnerships – multi-stakeholder platforms for increasing stakeholder collaboration	Stakeholder involvement in decision-making Multiple actors, including women
Resource use	Economically rational decision-making Cost recovery	Efficient allocations Cost recovery Equitable access
Sustainable development	Securitisation of resources	Demand management

WATER GOVERNANCE IN THE UK AND BANGLADESH

While it would be ideal to examine the above question in a large 'n' sample of national contexts globally, to provide a broad overview of trends, this paper employs two case studies for initial comparative analysis to pre-test the strength of these arguments. Here, we use the examples of a developed country (the UK) and a developing country (Bangladesh) to explore whether the nexus as a normative concept is becoming an empirical reality by examining water governance. England and Wales are utilised as an indicator of UK practice, since different approaches exist in Scotland and Northern Ireland (Benson et al., 2013b).

UK (England and Wales)

Water governance in England and Wales is historically complex (Cook, 1998). Modern attempts at integrating water policy started in 1930 with the national Land Drainage Act. It created catchment districts and dedicated catchment boards to manage flooding and land drainage. These catchment boards were replaced by regional River Boards in 1952, which also acquired responsibility for pollution control, water quality and fisheries (Lorenzoni et al., 2015). River boards were then converted into 27 regional river authorities in 1963, with overall authority for water tasks apart from sewerage and drinking water provision. This regionalisation continued under the Water Act 1973, which created ten multi-purpose Regional Water Authorities (or RWAs). Water supply was provided by statutory water companies while internal drainage boards maintained responsibility for water levels in certain agricultural areas. However, by the late 1980s, RWAs were widely perceived as having failed in their objectives, prompting demands for reform. They were reconstituted by the Water Act 1989 and then abolished by the Water Resources Act 1991, which created a centralised body, the National Rivers Authority, to take over the RWA's tasks. By 1995, the Authority was itself replaced by the Environment Agency which then became responsible for implementing government water policy. This policy

framework has, since the late 1970s, been increasingly determined by the European Union (EU) (Benson and Jordan, 2008).

Current water policy approaches in England and Wales appear to reflect more IWRM than nexus thinking. In terms of *integration*, the fundamental direction of water policy is set by the EU Water Framework Directive (2000). This Directive requires the implementation of river basin management planning (RBMP) within designated river basin districts (RBDs). Although this policy aims at integrating water quality objectives with other environmental requirements within the regional planning process,³ there is only limited strategic policy integration with other sectors. UK river basin management planning is currently integrating climate adaptation and also the 2007 EU Floods Directive requirements for producing flood-risk assessments, while linkages have been established with regional and local floods governance (Lorenzoni et al., 2015). However, integration with agricultural, energy and climate policy is somewhat lacking (Benson et al., 2012). Common Agricultural Policy funding can be used for agri-environmental improvements, which can help water quality, although much more interaction is required with water policy. The Department for Environment, Food and Rural Affairs (Defra), through The Rural Development Programme for England, has set up Catchment Sensitive Farming (CSF), which supplies technical advice and grants to farmers for reducing diffuse water pollution, to help meet WFD objectives. In this sense, the integration approach of RBMP, although limited in this context, is more water-centric than multi-centric, suggesting that it more readily conforms to traditional IWRM than nexus thinking. More evidence for this assumption comes if we consider governance structures. There are only limited frameworks incorporating the nexus at national level, where institutional fragmentation is highly evident. Although climate and energy policy, to an extent, have been merged with the creation of the Department of Energy and Climate Change (DECC), it remains a separate entity from Defra – which encompasses environment and hence water policy, alongside, although not necessarily in tandem with, agricultural policy. Even within Defra, rural development decisions tend to be taken by Natural England while water management is generally determined by the Environment Agency. Moreover, the nexus itself appears not to have entered policy discourses at government level, reflecting its limited institutional uptake. In water governance, the implementation of EU legislation does certainly reflect IWRM 'good governance' principles. An institutional framework to embed these principles has been established via the WFD process, with framing national legislation, implementing agents, river basin bodies and collaborative planning procedures (including public participation) now enacted across England and Wales.

The scale of governance is consequently primarily predicated on the regional, river basin districts mandated by the WFD, rather than on multiple scales. There are 10 RBDs in England and Wales, with one, the Solway-Tweed, shared with Scotland, which has adopted a different implementation approach. But there is some evidence of multi-scale approaches emerging. As discussed above, CSF schemes have been established for localised water bodies that are heavily impacted by non-point source (i.e. agricultural) pollution and thereby support the WFD process (Benson et al., 2013b; Natural England, 2014). In addition, Defra has pledged to promote catchment, or sub-regional, level water management schemes; again to support WFD implementation (UK Government, 2013). From the perspective of scale, the approach adopted is therefore strongly associated with IWRM but, critically, there is a movement towards more multi-levelled governance forms to better account for 'externalities' (House of Lords, 2012). Whether this reflects nexus thinking is, however, arguable.

Participation of stakeholders, moreover, occurs within dedicated river basin liaison panels (RBLPs) in each river basin district (Benson et al., 2014). The WFD requires three types of 'public' participation

³ When setting objectives for good ecological status of specified waters, account should be taken of other EU measures for environmental protection but also other uses of the waters, which could include flood protection, bathing or energy generation.

namely that: river basin plans be made public during their preparation; draft plans be made available for public comment; and that background documents be made publicly accessible (see Woods, 2008). Public engagement in the WFD process has been highly variable, with the approach adopted in England and Wales limited to the Directive requirements – what Ker Rault and Jeffrey (2008) call the 'letter of the law' – rather than a genuinely collaborative planning approach. River basin liaison panels, the main forum for stakeholder engagement in the planning process, are hence rather agency dominated (Benson et al., 2014). The pattern of public participation is therefore more reflective of IWRM principles, in terms of engaging different stakeholders in decision-making, although in a somewhat constrained manner (Fritsch and Benson, 2013). Despite the privatisation of water supply in the UK and the establishment of CSF catchment and national-level partnerships,⁴ there are few other discernible examples of nexus type public-private partnerships in water governance approaches, as envisaged by the WEF.

The WFD also embeds IWRM-type thinking on resource use and efficiency. One key requirement of the WFD is that economic analyses are conducted in the planning process. Accordingly, Section 38 of the Directive requires an "economic analysis of water services based on long-term forecasts of supply and demand for water" (Official Journal, 2000: 4). The main purpose is to support water pricing, or what the Directive calls the principle of the recovery of costs of water services (Art. 9 and Annex III), in order to internalise impacts. While this approach is not the same as the 'comprehensive economic analysis' for resource use suggested by the WEF, it does nonetheless oblige that decision-making should be economically rational. An economic analysis was consequently conducted for each river basin district, with the results utilised in the planning process (Fritsch and Benson, 2013). Approaches are therefore less reflective of IWRM principles such as equitable access, which although specified in the Directive (Art. 1) is not entirely manifest in UK practice.

Finally, the approach to sustainable development adopted in the WFD does prioritise water security, as defined above. A critical feature of river basin management planning is the introduction of a programme of measures (POMs) based on specific water quality objectives designed to ensure long-term sustainability of resources for differing purposes. Security concerns, it could be argued, do therefore underpin river-basin planning in the UK, although equally it could be suggested that the WFD also aims at demand management through water pricing as another means of achieving sustainable development.

Water policy in England and Wales is therefore complex but driven by the overriding demands of the Water Framework Directive. As implemented in this context, the approach to governing water resources primarily follows the influence of IWRM in terms of integration, governance structures, scales and participation. However, analysis would suggest that some elements of the water nexus, as defined above, are reflected in practice. Interestingly, the economic analyses compelled under the planning process are a form of economically rational decision-making while the notion of security is arguably at the heart of governance. Yet, the influence of nexus arguments remains questionable.

Bangladesh

Government intervention in water governance in Bangladesh can be traced back to 1959 (see Gain and Schwab, 2012). The sole responsibility for water management was given to the East Pakistan Water and Power Development Board Authority (EPWAPDA). In 1964, the EPWAPDA prepared a 20-year Water Master Plan, which was the beginning of water-sector planning in East Pakistan (now Bangladesh).

⁴ CSF catchment partnerships operate in nine priority catchments, identified by WFD River Basin Liaison Panels as being heavily polluted. National strategic partnerships bring together actors such as the Agriculture and Horticulture Development Board (AHDB), farmers' representatives and The Rivers Trust to promote reducing diffuse water pollution from agriculture (Natural England, 2014)

Aimed at increasing agricultural production, the Master Plan was based on a strategy of massive flood control and drainage to be followed by irrigation projects. Moreover, emphasis was laid on the construction of embankments and polders over much of the country (Nowreen et al., 2014). After Bangladesh became independent in 1971, responsibility for planning and management of water resources was handed over to the newly created Bangladesh Water Development Board (BWDB). However, the focus within water management remained almost the same (particularly regards increasing agricultural production). Currently, major institutions involved in water resources planning and implementations are the National Water Resources Council (NWRC), Water Resource Planning Organization (WaRPO), the Ministry of Water Resources, the Bangladesh Water Development Board (BWDB), the Local Government Engineering Department (LGED) and the Bangladesh Agricultural Development Corporation (BADC) (Rouillard et al., 2014). The NWRC, consisting of 47 members including the Prime Minister, is the apex national body relating to water management, which facilitates the coordination of water-related policies. The WaRPO supports the activities of the Executive Committee of the NWRC (ECNWRC) and is responsible for developing national water policies. The Ministry of Water Resources is the executive agency responsible to the Government for all aspects of the water sector.

Along with these institutions, the Government of Bangladesh formulated several policy documents for managing water resources of the country: the National Water Policy (NWPo), the National Water Management Plan (NWMP), and the National Water Act (Gain and Schwab, 2012; Rouillard et al., 2014). The NWPo, published in 1999, initiated the IWRM process, and outlines the main decision-making processes for water management in Bangladesh. The National Water Management Plan (NWMP), published in 2001, identifies the main national objectives and strategies for water management for 2000-2025. The National Water Act 2013 aims to better integrate the management, development, utilisation, and protection of water resources. Beside policy formulations, several organisations are responsible for implementing water-related projects and programmes. The BWDB is responsible for large-scale (greater than 1,000 ha) water projects, for example inland and coastal flood control, land reclamation and development works (e.g. irrigation), and rainwater harvesting. The LGED is responsible for the development and management of small-scale (1,000 ha and less) projects. The Bangladesh Agricultural Development Corporation (BADC) is responsible for farming, and is therefore involved in irrigation works.

As Bangladesh is highly climate vulnerable, the frequency and intensity of extreme climatic events are expected to increase in the coming years (Immerzeel, 2008; Karim and Mimura, 2008; MoEF, 2009; Gain and Hoque, 2013; Gain et al., 2013b; Gain and Wada, 2014). In addition, population pressure is high, economic development and urbanisation are unplanned (Gain et al., 2012), and poverty is a serious threat to national development (Ahmed et al., 2009). As water management in Bangladesh consequently faces immense challenges, the Bangladesh Government has adopted interdisciplinary approaches in the above-mentioned water policy documents (Nowreen et al., 2011). To understand how IWRM and nexus have been interpreted, we can analyse key water policy documents based on the six dimensions (see Table 1) of IWRM and the water security nexus.

Historically, there is a direct linkage in policy between water and food. The stated goal of the NWPo, adopted in 1999, was "to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people and protection of the natural environment" (MoWR, 1999). The NWPo recognised the interaction of water and food security through incorporation of different clauses on 'Water and Agriculture', 'Water and Industry', 'Water Rights and Allocation', and 'Public Water Investments'. In addition, the National Water Management Plan (NWMP) published in 2001, identified several national objectives and strategies relevant to water and food for short-, medium- and longer-term implementation. Some strategies have already been implemented. The National Water Act (NWA), published in 2013 supports food security while aiming for efficient and equitable sharing of water resources. However, despite

recognition of the importance of food security, policy 'integration' remains very limited and no specific strategy or policy has been introduced to foster such integration. Also, despite the NWPo mentioning hydro-power, policy documents do not consider implicit interactions between water and energy. Overall, current water resource planning in Bangladesh still fits a more water-centric than a multi-centric approach (Rouillard et al., 2014).

Investigating optimal governance for water policy requires consideration of social context. Economically, Bangladesh is still a low-income country (World Bank, 2014). Low levels of accountability among public officials, reported corruption, and lack of transparency in governmental decision-making are the main governance challenges (Alam and Teicher, 2012; Rouillard et al., 2014). The adoption of the NWPo was a milestone towards 'good governance' of water resources in Bangladesh (MoWR, 1999). However, low trust in governmental policies, including water policy, is manifest amongst local people (Bhandari, 2013; Gain and Schwab, 2012). Water policies of Bangladesh touch upon IWRM approaches through considering 'good governance', at least in writing. But the policy documents do not recognise implicit interactions among water, energy and food (as described above) and there are no integrated policies on nexus forms of governance.

Management scales also reflect the influence of IWRM. There are around 405 rivers in Bangladesh of which 57 are transboundary out of which 54 are shared with India and the remaining three with Myanmar. Therefore, river-basin-scale planning is essential for securing supplies of water resources in Bangladesh, a factor reflected in the NWPo (MoWR, 1999). River-basin-scale management can help better exchange of data and information between riparian countries in the region (Rahaman and Varis, 2009). In this regard, a Joint Rivers Commission (JRC) was established in 1972 which provided the institutional arena for maintaining dialogue between Bangladesh and India (Gupta et al., 2005). For managing water within the territory of Bangladesh, 173 catchments were identified in 1991 and grouped into 60 planning areas further aggregated into five regions (Gain and Schwab, 2012). Responsibilities for catchment planning are nevertheless maintained by the NWRC and WaRPO. However, although water policy documents recognise the river basin as the primary scale within IWRM, this is rarely found in practice since the JRC's role is limited and there are no real river basin authorities. In contrast, water management practices of Bangladesh do not yet incorporate multilevel scales anticipated in nexus approaches.

The extent of public participation in the decision-making processes has been gradually increased (Gain and Schwab, 2012). Public participation deficiencies were first identified in the 1990s by the government and international donors. This problem is considered the major cause of the poor operation and maintenance (O&M) of the BWDB's Flood Control and Drainage (FCD) system. Therefore, the Flood Planning Coordination Organization (FPCO) produced a set of guidelines for better participation in management projects in 1992 (Duyne, 1998), which led to the formulation of the Guidelines for People's Participation in Water Development Projects (MoWR, 1995); a policy document which was formally approved by the Ministry of Water Resources in July 1995. More comprehensive guidelines were produced for participatory water management in 2000 (MoWR, 2000). Here, stakeholder involvement is considered integral to water resources management in different stages of the project cycle i.e.; identification, feasibility, planning, design, implementation and O&M of water resource projects (Rouillard et al., 2014). The Government also recognised efforts to help build local institutions and to impart awareness of stakeholder involvement, including greater participation of women in water management (MoWR, 1999). In spite of these developments, water user groups still consider themselves widely ignored in decision-making (Gain and Schwab, 2012). In addition to stakeholder participation, water policy documents have emphasised public-private partnerships. According to the NWPo, the ultimate success and effectiveness of public water resources management projects depends on the people's acceptance and ownership of each project (MoWR, 1999). Therefore, policy documents recognise both IWRM and nexus views on public participation, although their practice is limited.

In evaluating the use of water resources, water policy in Bangladesh considers both IWRM and nexus views: economically rational decision-making; cost recovery; efficient allocation and, equitable access. Considering water as both an economic and social good, national policy recognises the economic value of water for different uses, the existence of opportunity costs, and the importance of fully recovering costs (MoWR, 1999). However, no organisation dealing with water pricing yet exists. By prioritising access to water as a human right, the NWPo also highlighted that water should be affordable through implementing a safety net for poor people (MoWR, 1999). The National Water Act additionally reserves the right to allocate water through equitable distribution, efficient development, and in-stream ecological needs – although there are no institutional mechanisms for managing water rights and protecting human rights in access to water (GoB, 2013; Rouillard et al., 2014).

Water policy documents do recognise water and food security concerns, but they hardly touch upon a broader view of 'security' between water, energy and food. In practice, policy frameworks focus on demand management. The management of water demand is also compounded by the vast expansion of irrigation associated with national policies for food security (Rouillard et al., 2014). Bangladesh policy for reducing water demand remains prioritised regulations, focusing in particular on water scarcity (Gain and Wada, 2014) in order to protect downstream users' needs (WaRPO, 2001). Policies for reducing water demand, however, are often vaguely formulated and do not include explicit implementation time frames (Gain and Schwab, 2012).

DISCUSSION AND CONCLUSIONS

Our introduction posed several questions regarding the water security nexus. Firstly, we asked *what is new about the nexus that did not exist in common knowledge?* By utilising some common conceptual indicators for cross-comparison, it is possible to show some commonalities and differences with past, and indeed present, global water management concepts: in this case, IWRM. A novel aspect of the nexus, according to supporters, is its ability to link different sectors such as water, energy, food and climate change in the management of environmental resources. A significant difference with IWRM, we argue, is the holistic nature of policy integration anticipated in the nexus concept: whereas IWRM aims at 'water-centrism', the nexus appears more 'multi-centric'. Another novel aspect is the prioritisation of resource security within sustainable development, although this notion is not tightly defined. Other differences pertain to scales, optimal governance, participation and resource use.

The nexus appears to offer some advances on IWRM but there are problems when presenting it as an alternative. Most notably, many ideas presented in nexus thinking already appear in pre-existing management strategies such as IWRM or even Environmental Policy Integration (EPI), which first entered policy discourses in the 1990s (see Jordan and Lenschow, 2008). The latter concept, outlined in the Rio UNCED Agenda 21, also argues that environmental concerns should be fully integrated with cognate policy sectors such as energy, agriculture and transport. This principle is also a primary objective of EU policy making, after legal codification in its founding treaties (ibid). Indeed, EPI and IWRM have existed as normative policy approaches for at least two decades and nexus supporters should therefore better distinguish the novelty of their approach. While the water security aspect is perhaps innovative, this may not constitute a completely new mode of water governance that offers alternatives to governments for pre-existing IWRM-type responses.

The second question we asked was *to what extent is such a nexus complementing, or even replacing IWRM?* As our multi-case design compared practice in two national contexts, we recognise that further comparative examples are required before drawing hard-and-fast conclusions. One answer for future study would therefore be to utilise a large 'n' quantitative survey of multiple countries. Nonetheless, the UK (England and Wales) and Bangladesh exhibit some trends. In both contexts, water management overtly reflects the influence of IWRM, suggesting that this paradigm is perhaps still dominant in developed and developing countries alike. Evidence from the EU would suggest that IWRM principles,

under the Water Framework Directive, are highly significant within national strategies. Bangladesh has also accepted the IWRM approach in response to its promotion by international bodies. Both national contexts provided some evidence of nexus type thinking entering national policy responses, mainly through rhetorical references to integration, but this hardly constitutes a discernible shift in how water resources are perceived, managed and sustainably developed.

This observation then raises further questions over the essentially socially constructed nature of the nexus and indeed IWRM. While IWRM has been heavily promoted to governments via international-level development discourses and has thus assumed a dominant position in water governance in many national contexts, the nexus has yet to permeate responses to such an extent – at least on the basis of our case studies. One reason may be institutional and even ideological path dependency: IWRM, as discussed above, has become gradually locked-in to policy discourses through a long historical progression of integrated, river-basin-scale management. Recent popularity of the concept in developing countries has also been facilitated by its promotion in international-led development strategies. The nexus policy discourse, meanwhile, has primarily been driven by corporate interests (the WEF) and, to an extent, academics purporting to offer novel governance solutions to global crises but offering only limited conceptual and practical guidance. To ensure greater uptake of such ideas amongst governments, supporters should therefore be much clearer on how they can complement or even supplant pre-existing governance approaches.

On this note, we can consider our final question, namely *what policy recommendations can be made on the basis of the analysis for enhancing the nexus in national contexts?* If the nexus approach is normatively desirable, as recent research and international political activity might suggest, then one answer would be better integration of sectoral policies with water management at different governance levels. Our analysis only hints at this approach as both a normative political strategy and research agenda, therefore providing a basis for future study. The multilevel governance and coordination of the nexus would therefore appear to demand greater discussion. Yet, this approach is, to an extent, already anticipated within existing IWRM policy, as discussed above, even though integration is proving problematic. Another way of enhancing the nexus worldwide could therefore be to more strongly stress security (see Bakker 2012; Cook and Bakker 2012; Bogardi et al., 2012) in the sustainable development of water, food, energy and climate sectors. Scope exists within current IWRM practice to better shift water governance from prioritising *inter alia* demand management and resource efficiency towards securing an acceptable quality and quantity of water for all users and ecological protection: all key objectives of IWRM. A critical issue here is how best to balance water, agricultural and energy security at multiple scales. Current nexus arguments still remain highly ambiguous on this subject, inferring a need for strategic policy guidance and institutional structures across multilevel governance. Research into 'local nexus' approaches is also then required. Scotland, for example, is formulating a common, inter-linked policy framework for water and agriculture via its Land Use Strategy (Rouillard et al., 2013). The promotion of the nexus in policy, in this respect, could then be more aimed at complementing IWRM through a securitisation focus.

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