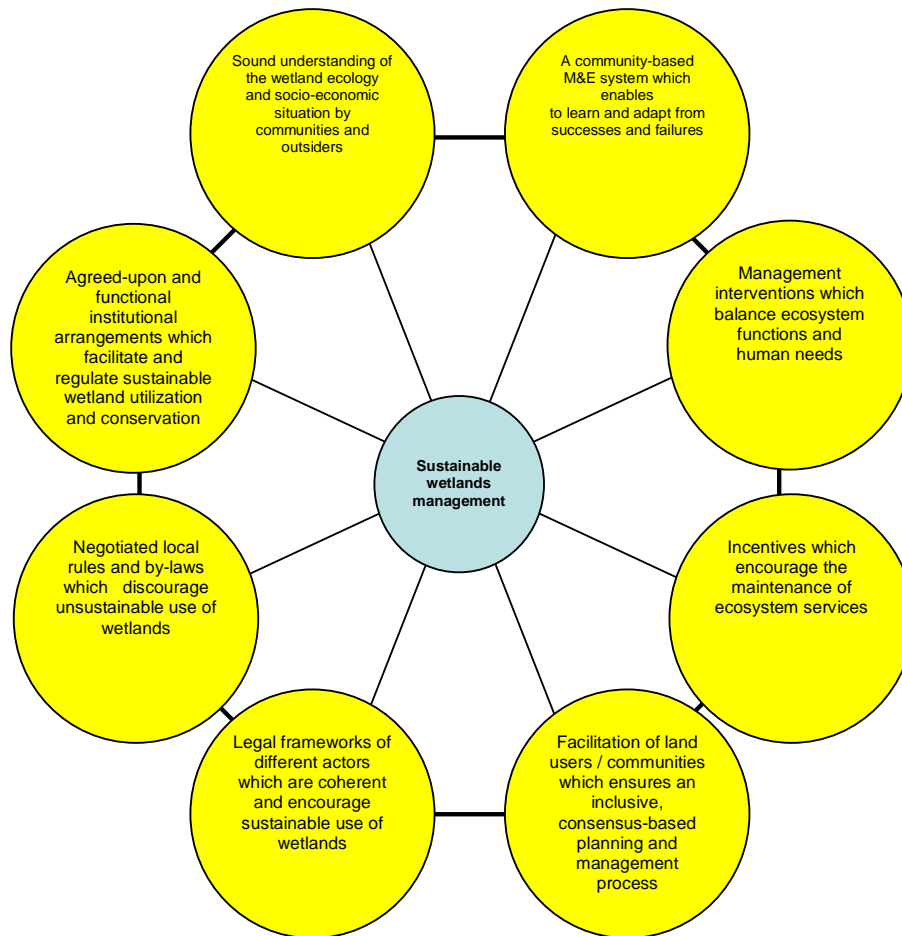


Guideline for sustainable wetland management and utilization: key cornerstones



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List of Abbreviations

CGIAR	Consultative Group on International Agricultural Research
CP30	Challenge Programme on Water and Food Project Number 30
CPWF	Challenge Programme on Water and Food
CNRM	Community Natural Resources Management
DSE	
EMA	Environmental Management Authority of Zimbabwe
LRB	Limpopo River Basin
MDG	Millennium Development Goals
MA	Millennium Ecosystem Assessment
NGO	Non Governmental Organisation
IWMI	International Water Management Institute
UEM	University Eduardo Mondlane
IRD	Institute de Recherche pour le Developpment
UZ	University of Zimbabwe

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1. Introduction

1.1. Background

This guide presents an approach for sustainable utilisation and management of wetlands, with a special focus on wetlands that are utilized for livelihood purposes such as agricultural production, water provision for primary and productive purposes, harvesting of edible and non-edible materials, and as grazing resources for livestock. It is based on observations and analyses at three wetlands in different parts of the Limpopo basin. It is designed to help natural resource managers, agricultural extension workers, and other environmental workers to design management interventions that work for site specific situations.

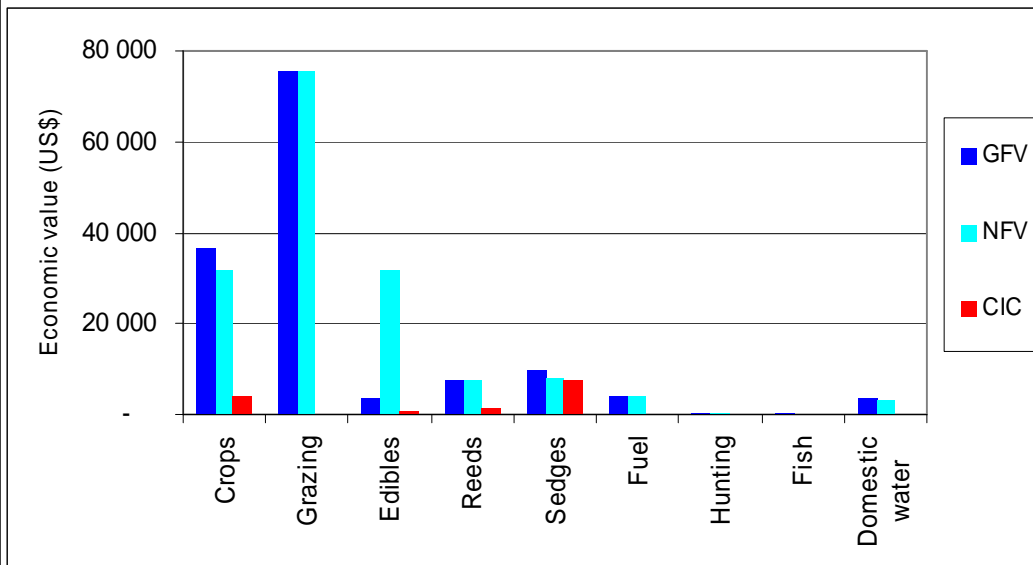
The guide is founded on the basis that the potential of wetlands to contribute to livelihoods is closely related to their ability to maintain ecosystem functions (such as regulating river flows), which is a consequence of their unique hydrological characteristics. This underscores the need to strike a balance between conservation and productive use of wetlands. The guide makes the point that wetlands have to be used and managed within a sustainable development framework, a concept that reconciles development and environment (Brundtland, 1987), which in recent years has found practical expression in the form of Millennium Development Goals (MDGs). The issues addressed in this guide can make a direct contribution to MDG1 (Eradication of extreme poverty and hunger) and MDG 7 (Ensuring environmental sustainability). Regarding MDG1, wetlands assure food production because of water availability and also contribute to increased income from agricultural activities and harvesting of natural resources. Wetlands also provide buffers by enabling food production in drought years. Wetland management contributes towards ensuring environmental sustainability (MDG7) through the maintenance of vital ecosystem services provided by sustainable agricultural practices (in terms of sound hydrological and pollution management) and balanced exploitation of resources are practised.

This guide is complementary to, and draws from other guides on sustainable wetland management. Its overarching goal is to ensure sustainability in the way wetlands are utilized and managed. The Ramsar Convention on Wetlands has promoted the management of wetlands with an emphasis on maintaining their ecological character through the wise use of wetlands and their surrounding landscapes. The Ramsar Convention (in 2005) defined wise use of wetlands as the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development. The approaches promoted through the Ramsar Convention, among other things, underscore the need for wetlands to be used by and support the wellbeing and livelihoods of many people, and that this should be based on effective involvement of local communities in all stages of wetland management. The Convention has placed an equal emphasis on the policy and planning environment for sustainable management of wetlands, alongside the technical tools that can be used to support the implementation of policies and management actions. The policy and technical tools have been combined to form a series of handbooks known informally as the Ramsar “toolkit” or formally as the Ramsar Handbooks for the Wise Use of Wetlands (http://ramsar.org/lib/lib_handbooks2006_e.htm). The Millennium Ecosystem Assessment (MA, 2005) further stresses the importance of ecosystem services for human well-being. It points out that while intensive use of ecosystems often produces the greatest short-term advantage, non-sustainable use can lead to losses in the long term. Wetland ecosystem services closely linked to human well-being are provision of renewable freshwater, agricultural production, supply of fish, climate regulation, and mitigation of climate change (MA 2005).

1.2. Why tailored management interventions for wetlands are necessary

Wetlands in southern Africa provide a number of ecosystem services which are vital to the livelihoods of many poor people, the majority of whom are rural-based and depend on agriculture. As food prices increase wetlands are also increasingly being utilized by urban dwellers for household food production and income generation. Other important services provided by wetlands include provision of grazing, water for domestic and productive purposes, materials for building and craft activities, as well as edible plants and animals (Table 1.1). In agriculture wetlands with regular water availability are used to mitigate the problem of low crop yields, especially in areas characterised by low and erratic rainfall, and frequent droughts. Crop production on residual moisture and irrigation in seasonal wetlands supported by shallow groundwater present in some wetlands is considered a source of both income and food (for example by farmers in the dambos in Malawi, Zambia, and Zimbabwe (Box 1. 1). Fishing activities in wetlands, for example in Lake Chilwa in Malawi and the Lukanga swamps in Zambia provide the much needed protein in rural diets. Fish sales also contribute significantly to the Malawi economy (Box 2). This role of wetlands in supporting the lives of rural communities in southern Africa is increasingly known (Turpie et al., 1999; Masiyandima et al, 2004).

Box 1.1 Wetland activities supporting livelihoods through provision of food and income at GaMampa wetland, Limpopo Province, South Africa



Wetland stakeholders at GaMampa engage in a combination of wetland-based livelihoods activities that make up a livelihood system. Households choose an optimal set of activities based upon their needs and resources at any given point in time. The graph shows the gross financial value (GFV), net financial value (NFV), and cash income (CIC) derived from the wetland in 2006 (Adekola, 2006)

Box 1.2 Fishing and crop production in Lake Chilwa wetland, Malawi

Fisheries are considered as the most important resource on Lake Chilwa, with yields of up to 25,000 tonnes per annum (Lake Chilwa SOER, 2000).

Provisioning of food from wetland irrigation activities is another seemingly important function the Lake Chilwa wetland. Irrigation is carried out between May and October along rivers that flow into the wetland. Crops produced through irrigation include rice, maize and vegetables. A total of nine rice irrigation schemes are located in the wetland, with some of the irrigation scheme farmers earning ten times as much per month as ordinary farmers (Schuijt 1999 in Lake Chilwa SOER, 2000). The major problem with irrigation is water shortage especially at the end of the dry season during the months of October and November, which limits farmers from cultivating larger areas.

Irrigation case study: Domasi rice scheme (Source: Lake Chilwa SOER, 2000)

The Domasi rice scheme covers an area of 470 hectares of irrigable plots and 2,165 farmers are in the scheme with allocated plots. Farmers are assisted through training and technical advice and loans are available for fertilizer and seed purchases. Annual potential turnover per hectare per year is 11.5 tonnes: 6 tonnes in the wet season and 5.5 tonnes in the dry season. Of this 75% is sold as paddy rice and 25% as milled rice. Table 3.2 reveals the gross benefits of the Domasi rice scheme per year. The gross benefit for the Domasi rice scheme is US\$1,272,260 per year. Less costs (milling, seeds and fertilizer) the amount is US\$1,195,473 per year or an average of US\$552 per person per year.



Wetlands also deliver a wide array of hydrological regulation services such as flood amelioration and erosion control, both in the wetland itself and beyond. For example, swamps, lakes, and marshes promote flood mitigation and groundwater recharge as well as regulate river flows (MA, 2005). Consequently, altering the wetland environment through cultivation, putting in place interventions that make the wetland more conducive to producing crops (e.g. drainage), and through other livelihood uses (such as harvesting wetland plants, livestock grazing) has potential to impact not just the wetland itself, but also the adjacent upstream and downstream areas. While the nature and value of services differs across wetland types (MA, 2005), wetlands are generally important where they occur.

By their nature wetlands are fragile, and are prone to degradation. If left unchecked this will result in loss of some of their essential functioning. For farmers and other wetland users, the overall benefit of sustainable wetland ecosystem management may often exceed that of converting the wetland ecosystem for farming or other uses. However, because of the immediate financial benefit, the conversion of ecosystems is often favored. In semi-arid areas there is increasing pressure for

development of wetlands for agriculture to ensure food security and supplement household incomes. During drought, wetlands take on an even greater importance. As water resources become more and more scarce, wetlands provide a resource in an otherwise dry environment (Jacobs, 2006). Wetlands also provide habitat for a range of threatened plants and animals. Under these circumstances it is important to ensure that such wetland development does not compromise ecosystems services. But there is a valuation problem - for example it is often the case that the environmental security of local people is compromised by under-valuing the benefits derived from wetlands.

Table 1.1 Ecosystem services provided by or derived from wetlands (source: MA, 2005)

Services	Comments and Examples
Provisioning	
Food	Production of fish, wild game, fruits, and grains
Fresh water	Storage and retention of water for domestic, industrial, and agricultural use
Fiber and fuel	Production of logs, fuel wood, peat, fodder
Biochemical	Extraction of medicines and other materials from biota
Genetic materials	Genes for resistance to plant pathogens, ornamental species, and so on
Regulation	
Climate regulation	Source of and sink for greenhouse gases; influence local and regional temperature, Precipitation, and other climatic processes
Water regulation (hydrological flows)	Groundwater recharge/discharge
Water purification and waste treatment	Retention, recovery, and removal of excess nutrients and other pollutants
Erosion regulation	Retention of soils and sediments
Natural hazard regulation	Flood control, storm protection
Pollination	Habitat for pollinators
Cultural	
Spiritual and inspirational	Source of inspiration; many religions attach spiritual and religious values to aspects of wetland ecosystems
Recreational	Opportunities for recreational activities
Aesthetic	Many people find beauty or aesthetic value in aspects of wetland ecosystems
Educational	Opportunities for formal and informal education and training
Supporting	
Soil formation	Sediment retention and accumulation of organic matter
Nutrient cycling	Storage, recycling, processing, and acquisition of nutrients

Wetland loss¹ as a result of agricultural expansion is a global concern. The primary direct drivers of degradation and loss include infrastructure development, land use, water withdrawal, pollution, overexploitation of resources, and the introduction of invasive alien species (MA, 2005). In 1996 the OECD estimates that globally more than 50% of the wetlands that existed in 1900 had been lost to agriculture (OECD, 1996). The Africa region is characterized by paucity of data and published quantitative results (OECD, 1996). But Taylor et al. (1995) indicate that in specific catchments (e.g. the Tugela and Mfolozi in South Africa) at least 50% of the original wetland area had been lost. When

¹ According to the Ramsar Convention, wetland loss is the loss of wetland area, due to the conversion of wetland to non-wetland areas, as a result of human activity (Mosar et al., 1996).

individual cases are taken into consideration it appears that the expansion of agriculture into wetlands will continue to be a major driver of wetland loss, and will lead to losses of ecosystem services (Figure 1.1). Such a trend will negate the poverty reducing potential of wetlands. In southern Africa where wetland based cultivation is on the increase, loss of ecosystem services provided by wetlands is expected to continue. In some cases the wetlands may be impacted in such a way that they lose their capacity to continue to provide other ecosystem services in the long term.

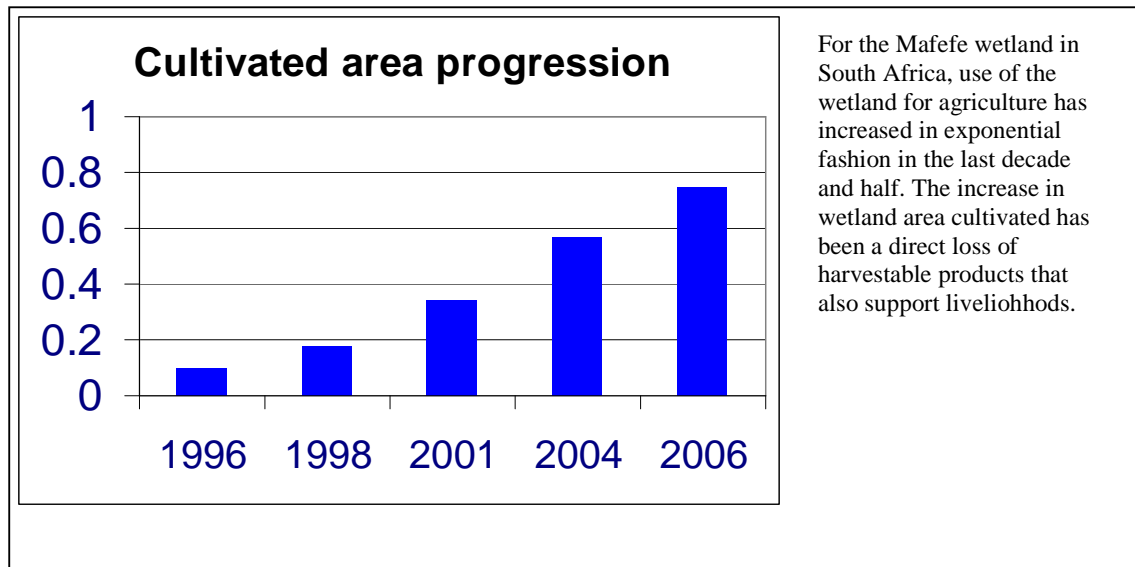


Figure 1.1 Increasing cultivation in Mafefe wetland in South Africa

The ability for inland wetlands, in their natural state, to mitigate floods is diminished when they are cleared for agriculture. While food production is an important developmental goal, tradeoffs between food production and loss of flood amelioration, harvestable plants for food and crafts, etc. need to be worked out. Wetland users need to be aware of the challenges that relate to wetland utilisation. They need to know that there is a real danger that in the long term the capacity of wetlands to support agricultural production will be negated as a consequence of unsustainable agricultural practices. Besides local impacts that directly affect wetland users, there are offsite implications associated with wetland use. Among these are impacts on hydrological regulation, meeting downstream flow requirements, and impacts on biodiversity.

The existing environmental regulatory situation in southern Africa tends to overemphasise the ecosystem services provided by wetlands to the detriment of livelihoods functions. In a number of countries regulations do contain punitive measures for producing crops in wetlands within stated boundaries. However, there is often a lack of monitoring and enforcing mechanisms and unsustainable use tend to go unnoticed and if noticed, unpunished or punished in a way that is not deterrent. Given the current shortcomings of the regulatory regimes that emphasise conservation above livelihoods of local population, state interventions in wetlands have become spectacular failures. Fortunately there are efforts to correct this. The project on Wetlands-based Livelihoods in the Limpopo River Basin (LRB) addressed some of the challenges associated with wetland utilisation in three wetlands. The project used a combination of methods to investigate the balance between livelihood benefits of wetland uses, and the environmental security of the wetlands and their catchments. The mix of agricultural water use strategies and other livelihood strategies, and the trade-offs among the uses, were investigated so as to inform development of guidelines and tools to assist decision-making

processes. The research was premised in that wetlands can be managed in a sustainable manner, and that a balance between conservation and agricultural production can be achieved.

1.3. Purpose of this guide

This guide was designed to make a contribution to sustainable utilization and management of wetlands in southern Africa. It contributes towards the needs and interests of three main groups of stakeholders who can participate in management of wetland ecosystems. First, it provides some examples of wetland management based on observations in communities whose livelihoods depend on wetlands goods and services. Second, for policymakers interested in ensuring that wetlands are used for agriculture and for other ecosystem services in a sustainable manner, the guide shows the complexity of putting in place functional institutional arrangements that ensure sustainable wetland utilization and hence the importance of considering the linkages and interactions of the different governance arrangements in a wetland. Finally, researchers keen to ensure that utilization and management of wetlands is based on the best available information, are provided with a framework for their research questions formulation and framing of research results to ensure relevance to the policy and practical environment.

This guide comes at a time when several countries in southern Africa still have fragmented legislation governing the use of wetland ecosystems; the same guidelines that have been in place in some case for at least fifty years. In many cases the legislation is poorly formulated in scope and depth, and is characterized by fragmentation across ministries. In addition to the fragmentation, the legislation is fraught with implementation challenges. The existence of wetland agriculture in more than 100,000 ha of wetlands in southern Africa is evidence that existing legislation cannot be enforced. Communities continue to use these wetland ecosystems to support livelihoods through activities including agriculture, fishing, and harvesting natural products. Legislation governing their use should take cognizance of livelihoods.

The main aim of this guide is to provide a framework for utilizing and managing wetlands, particularly those wetlands whose ecosystem services are used for livelihood purposes. This demands that a way be found to reconcile the value of ecosystem services that accrue to the livelihoods and the conservation of this important resource in the long term. The guide delivers practical management solutions at three stakeholder levels: farmers and other natural resource users, natural resource management agencies, and governments. It complements government efforts in their quest for effective regulation of wetlands utilization and management. To this end it should be seen as support for and not a replacement for existing efforts at sustainable wetland management.

Section 1 of this guide provides a background to wetlands and the challenges to wetland management as well information on how to use this guide. The framework that was adopted for the sustainable management of wetlands as well as a brief description of the approach used to develop the guide is in Section 2. In Section 3 the framework for sustainable wetland management is outlined. In this section the basic principles of wetland management are discussed and the operational cornerstones for sustainable wetland management are explained. In the fourth and final section a summary of the approach is given.

1.4. How to use this guide

The guide was developed out of practice and it could be used mainly to inform better practice as described.

1.4.1 The guide as a to design sustainable wetland management interventions

In setting up a wetland management intervention, the context could be analyzed along the cornerstones together with the main stakeholders and the main areas of interventions of the project defined on the basis of the joint analysis. For example, for the management interventions to balance ecosystem functioning and human needs cornerstone, analysis could relate to:

- What exactly do we mean by technical management interventions to balance ecosystem functioning and human needs?
- Why is it important that we have technical interventions that balance ecosystem functioning and human needs?
- Are there technical interventions that balance ecosystem functioning and human needs really in place?
- How do we know that the technical interventions balance ecosystem functioning and human needs?
- If there are no technical interventions that balance ecosystem functioning and human needs in place is it a hindrance to sustainable wetland management?
- What do we need to do to ensure that unavailability of technical interventions that balance ecosystem functioning and human need does not become a barrier or to overcome the gap?

Key functions and related possible partners can be identified in an inclusive and rigorous process in which all partners will win through synergies. The guide could be used to inform researchers on what areas to focus on and also select required partners and prioritize their core activities in a holistic perspective.

1.4.2 The guide as a framework to monitor and evaluate wetland management

Wetland management programme implementation teams can use this guide to reflect on their interventions and analyze the state of the art for each cornerstone. This could help them to reach a common perspective on where the initiative is and what they consider success and what the knowledge and design gaps are in the existing intervention. An iterative self-reflection with the whole team and some stakeholders can be a powerful way of steering a wetland management intervention and learn systematically together. Every year there will be useful new insights that might require to be dealt with to make the whole intervention process work as a system rather than just focusing on some components.

1.4.3 The guide as a knowledge management tool for wetland management interventions

The lessons and experiences and methodologies/tools used to enhance each of the cornerstones can be collected, synthesized across programmes. For example a few initiatives could try to address the key question of facilitation of land users or communities which ensures inclusive consensus based planning and management process and the methods/tools used, success/failures achieved can be collected, synthesized across the initiatives and put back into the framework . This way the guide will help the build up of and enhance a rigorous and systematic learning in institution/networks increasing operational knowledge from a multi-stakeholder knowledge management system. It will foster an analysis of lessons and methodological knowledge within programmes and across agencies.

1.4.4 The guide as a tool to create a common understanding and vision for sustainable wetland management interventions

The guide could be used to create a common understanding of an implementation process as a result of the joint analysis on the basis of the different cornerstones. It could help stakeholders learn together and facilitate them to recognize the complexity and find ways of handling the complexity. For example for the cornerstone agreed-upon and functional institutional arrangements which facilitate and regulate sustainable wetland utilization and conservation, partners can discuss and agree on what the functional institutional arrangements look like and how to put them in place. Also by going through this cornerstone in detail it will be possible to see how it is linked to the other cornerstones.

2. A framework for sustainable management of wetlands

This guide was developed using the LearningWheel methodology of Hagmann (2005). The LearningWheel Methodology generates experience-based conceptual frameworks from practice, building on the lessons and success factors of practical examples in an analytical and appreciative manner (infor@picoteam.org). Using this methodology in an interactive facilitated workshop, and following a series of analytical steps, success factors, which are central to sustainable wetland management by the researchers of the Wetlands-based livelihoods in the Limpopo River Basin project (CP30) and specialists in Participatory Land Use Planning and Water Governance and Institutions success factors for wetlands management were identified. The success factors were conclusions from detailed site specific research focusing on livelihoods, institutions, hydrology, and plant biodiversity. The success factors were clustered into “cornerstones” and systematized into a LearningWheel framework. The cornerstones can be understood as conceptual maps for thinking about sustainable utilization and management of wetlands, and bring together issues relating to policy and implementation. They constitute the basic principles that can be applied in realizing sustainable utilization and management of wetlands.

Each cornerstone was further processed into “elements”, which are the major issues and challenges. In addition, key strategies that need to be in place so as to deal effectively with the challenges were identified. Again based on their practical experiences, workshop participants identified the key actors for each cornerstone. Case studies informed the framework. The framework is viewed as an open-ended “learning frame” for knowledge management in multi-stakeholder initiatives.²

The eight cornerstones for the sustainable management of wetlands outlined in this guide are consistent with the Ramsar Convention, are:

1. Sound understanding of the wetland ecology and socio-economic situation by communities and outsiders
2. A community-based monitoring and evaluation system which enables to learn and adapt from successes
3. Management interventions which balance ecosystem functions and human needs
4. Incentives which encourage the maintenance of ecosystem services
5. Legal frameworks of different actors which are coherent and encourage sustainable use of wetlands
6. Negotiated local rules and by-laws which discourage unsustainable use of wetlands
7. Agreed-upon and functional institutional arrangements which facilitate and regulate sustainable wetland utilization and conservation
8. Facilitation of land users / communities which ensures an inclusive, consensus-based planning and management process

² Missavene (Chibuto) wetland in Gaza Province, Mozambique; GaMampa wetland in Limpopo Province in South Africa; and Intunjambili wetland in Matabeleland South Province in Zimbabwe.

The conceptual overview of the cornerstones according to the LearningWheel approach is shown in Figure 2.1. Each cornerstone is described in section 3.

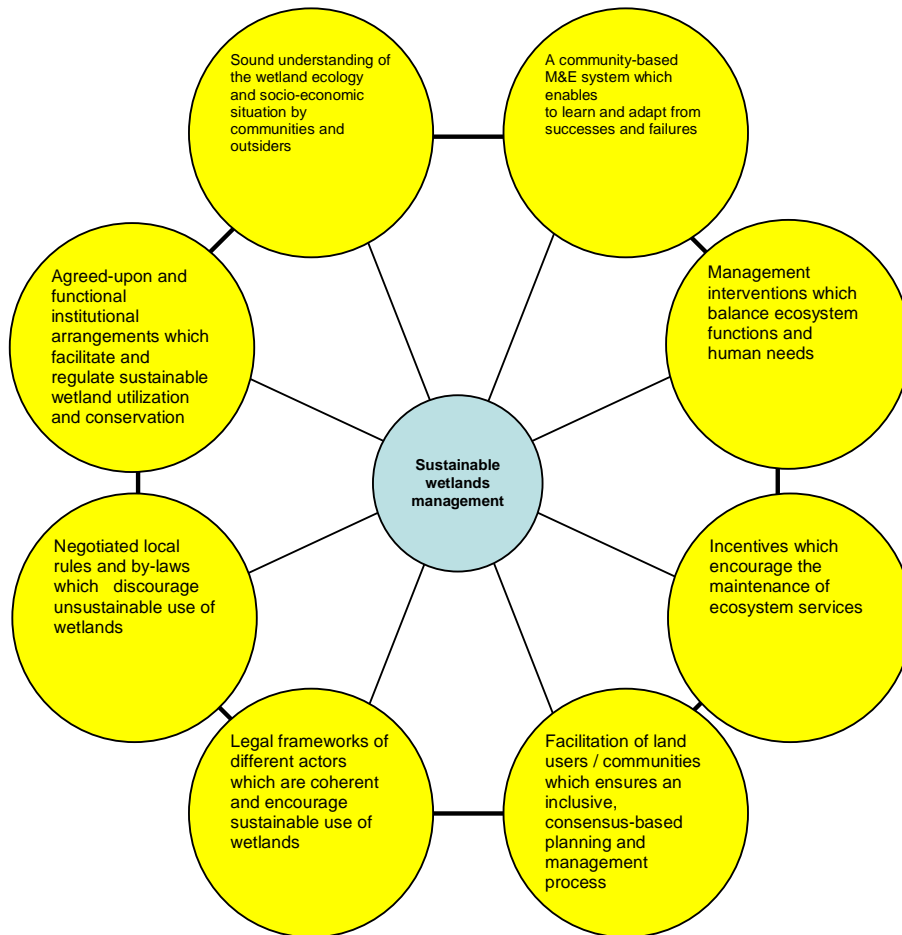


Figure 2.1 Conceptual framework for sustainable Wetlands Management

3. Description of cornerstones that frame sustainable management of wetlands

The description of the cornerstones that frame sustainable management of wetlands should be read with the understanding that the order in which they appear does not indicate their relative importance. Each cornerstone is equally important. Each cornerstone description tries to provide answers to four critical questions, namely

- Why is the cornerstone important?
- What will be achieved by operationalizing the cornerstone?
- Who are possible actors and their roles that can make a meaningful contribution to operationalizing the cornerstone?
- What are the major issues and challenges that need to be addressed?

3.1 Cornerstone 1: Develop understanding by the local community and external stakeholders of the wetland ecology and the socio-economic situation process

3.3.1 Relevance of the cornerstone

Understanding the relationships between wetland utilization, biophysical characteristics and socio-economic factors is essential for a full understanding of the causes and dynamics of wetland change and forms the basis for sustainable wetland management. The purpose of obtaining information is to improve the understanding by the community who most directly use the wetland, as well as others, to provide a basis for informed management decisions. This is a prerequisite for sustainable wetland use through appropriate management interventions. The information should cover the biophysical components of the wetland and how it functions as well as the social and economic factors that drive wetland utilization and many of the management decisions that will be made. The collection of information on the ecology, hydrology and the socio-economics should support an analysis of the importance of the ecosystem services that are obtained from the wetland as well as guide the development of management plans for the wetland. This in turn should support decision-making about trade-offs between services or amongst users, or provide information that can be used to enhance one or other service in a sustainable manner. Information needs to be obtained from multiple sources including scientific monitoring (hydrology, biodiversity, etc), direct observations, and community based monitoring of key simple indicators. Strategies for obtaining information are outlined in Table 3.9.

3.3.2 What do we want to achieve?

The strategies and processes for this cornerstone support the collection and use of information about the wetland and its uses to support more informed decisions about interventions for sustainable use as well developing wetland management plans. The information is required to ensure that wetlands are not degraded and the important ecosystem services are maintained or enhanced. It is also required to support decisions about trade-offs between services and users and enable these decisions to be made openly and with full awareness of the consequences for other services and users. Where trade-offs are being made it may also be necessary to introduce incentives or compensation to ensure sustainable social and biophysical outcomes.

3.3.3 The possible actors and their roles

A mix of local people and external experts from different organizations should be involved with this cornerstone. The development of greater understanding of the ecology, hydrology, socio-economic and institutional arrangements for wetlands will involve experts and scientists with specific skills to identify and describe and, where possible, quantify the relevant scientific components of the wetland and the manner in which it is managed. These activities should be undertaken in conjunction with local people who are familiar with the wetland and the manner in which it is used and managed (see cornerstone 8). Scientific experts should be drawn from agencies or organizations dealing with agriculture, water or the environment or with social and economic policy. Community-based or non-governmental organizations with skills or links to the wetland can also play an important role alongside local users and managers. At times it may be necessary to corroborate the knowledge collected from different sources, not simply as a means of verifying which is the more accurate, but to ensure that the best mix of information and knowledge is being applied under different circumstances. This is especially necessary when new management issues are being addressed, for example, when a change in use is suggested.

Scientists from agencies would generally provide advice and collect and analyze specialist information in support of the key strategies and processes and complement the knowledge already held by local people. Wetland managers would act upon the advice provided and assist community members to implement the strategies and processes.

3.3.4 The issues and challenges faced by wetland users

With increasing pressure on wetlands through population growth and increased demand for food products both local use and for trading, there is an increasing need to address the limits of acceptable change and balance different uses. As wetland users seek to produce more food, they need to be aware of the limits to which the wetland can be used sustainably. They also need to balance their needs against those of other users. This cornerstone supports the provision of information that can be used to make these decisions and to provide information for negotiated outcomes between competing uses and users. The key motivating factor to obtain and make use of this information is the rapidity of change and possible non-sustainability of resource use in the wetland, linked with possible conflict between users. Information is required to balance the needs of different users and ensure the resources are not degraded and lost.

3.3.5 Promising strategies

The promising strategies cover four major elements:

- Compilation of an inventory and identification of the main features of the wetland including description and quantification of the ecological and hydrological components and the position of the wetland in the catchment.
- An analysis of the socio-economic conditions and land uses within and around the wetland including description of household and individual relationship(s) to the wetland, the benefits obtained from the wetland and trade-offs between ecosystem services and between beneficiaries.
- An analysis of the institutional arrangements that influence management of the wetland including the identification and description of the current organisations, institutional arrangements and their linkages connected to the wetland.
- An outline of the important ecosystem services obtained from the wetland and the important trade-offs in place or required for sustainable use, including identification and quantification of the extent and value of the ecosystem services and the beneficiaries.

The Gorongosa National Park case study (Box 3.1) details an example how this cornerstone has been put in place.

Box 3.1 Information and knowledge needs: example of the Gorongosa National Park, Mozambique

The need for scientific information to support both biodiversity conservation and human development is recognized as a top-priority by the management of the Gorongosa National Park in Mozambique. The Gorongosa National Park, located in the Pungwe Valley, is centered on Lake Urema. The floodplains surrounding the lake are highly productive, comprising a range of diverse temporal habitats with the capacity to support large numbers of animals. The lake itself supports large numbers of hippopotamus, crocodiles and water birds and is an important source of fish for several communities living close to it. The Park is recognized both as an important part of the natural heritage of Mozambique as well as a potentially important economic asset through generation of income from tourists.

Multi-disciplinary research and monitoring projects established by the Park management seek to provide insights into both the ecological functioning of the Park as well as the socio-economic factors that are driving change and threaten conservation. Through monitoring, both within the Park itself and in the catchment of the Lake, information is collected to:

- Improve ecological management of the ecosystem
- Understand the effects of people on the Park
- Understand the effects of the Park on people
- Measure success in sustaining livelihoods and building a “social fence” for conservation
- Manage knowledge for sound decision-making

Understanding the ecology of the wetland

Activities have focused on developing GIS and inventory of wetland vegetation and animals within the park. This has included the use of aerial surveys and remotely sensed data to understand the current condition and how things are changing over time. Monitoring networks have been established, in conjunction with relevant national institutions (e.g. government departments and universities), to provide information on the role of both water and fire in wetland dynamics. Understanding gained will provide insights into how land clearing, deforestation and water resource development in the catchment impact the hydrology and consequently flooding of the Lake Urema floodplain system.

Understanding the socio-economic conditions – why people utilize the wetland and how

Recognizing that the sustainability of the Park is dependent on the communities living in its vicinity, activities have focused on measuring baseline indicators of human welfare and understanding the resource requirements of local people to maintain their livelihoods. Information has been obtained by conducting interviews and socio-economic questionnaires in the four main districts surrounding the park. Significant efforts have been made to strengthen communication between local communities and the Park management.

Understanding the current institutional arrangements and their linkages across scales.

The institutional arrangements for management of the Gorongosa National Park and associated wetlands are complex and involve a multitude of agencies, including the federal Ministry of Tourism, the regional government (ARA Centro) and the Carr foundation (a US non-profit organization established to conserve the ecosystem of the National Park). Local institutional arrangements have been deduced through the social surveys conducted (see above) and through the efforts of the park management to understand the mechanisms driving change in the catchment surrounding the Park.

Understanding ecosystem services provided by the wetland, to whom they accrue and their value

Ecotourism is envisaged as the primary ecosystem service coming from the Park. This is defined as tourism that doesn't harm the environment, pays a significant portion of the park's management and conservation costs, and generates income and social benefits for local communities. Other tangible ecosystem services are those that local communities acquire through utilization of the natural resources, including fisheries from Lake Urema. The importance of these resources, especially during periods of drought and flood, are being determined.

Source: DSS annual report (2007)

It is important to put in place strategies to enhance understanding of wetland ecology (Table 3.1).

Table 3.1 Strategies to ensure understanding of wetland ecology and socio-economic characteristics

Major elements	Key strategies and processes	Possible ways to implement
Understanding the ecology of the wetland	<ul style="list-style-type: none"> • Describe and quantify (wherever possible) ecological components of the wetland, including their spatial and temporal dimensions and linkages • Describe the important ecological and hydrological processes that characterise the wetland, including spatial and temporal variations • Evaluate the wetland in the context of the catchment in which it exists and its importance at local, regional, national and international levels. 	<ul style="list-style-type: none"> • Undertake a wetland inventory / description (from a basic to a more detailed level as practicable) using relevant information at site, catchment and national scales. Include scientific surveys (e.g. ground data etc and/or remote sensing) and incorporate local knowledge (refer CP30 sub-project on Wetland Assessment Framework) • Identify the physical location of the wetland in the catchment and connectivity to the river or other wetlands; the source of water; the relative ecological importance of the wetland; and possible impact of upstream/downstream development (e.g. dams, irrigation, pulp mills, etc.). Make use of the basin management plan. • Identify key indicators and establish monitoring networks combining where possible community-based observations with instrumentation (e.g. rain gauges and staff gauges read and recorded by community members).
Understanding the socio-economic conditions – why people utilize the wetland and how	<ul style="list-style-type: none"> • Describe the social and economic features of the wetland and the immediate surrounds. Include for example, information of the demographics, gender, wealth, education, infrastructure, wetland tenure, access, and local culture (religious, spiritual links to wetland). • Determine household and individual relationship(s) to the wetland (i.e. who uses the wetland, what services do they make use of, when/where, how). • Describe and quantify the benefits obtained from the wetland, including use and non-use values, and whether for local subsistence or trade. • Identify, describe and quantify trade-offs between ecosystem services and between beneficiaries. 	<ul style="list-style-type: none"> • Conduct household surveys and use participatory techniques to understand peoples' relationship to the wetland. • Undertake a stakeholder analysis through semi-structured interviews and other methods to obtain information on perceptions of wetland values. • Conduct a study to quantify the uses of the wetland by households and individuals and the relative contributions from the wetland to incomes and livelihoods (including stratification by gender and wealth class etc.). • Map land-use within and around the wetland. • Identify any conflicting uses and likely implications for sustainable management interventions.
Understanding the current institutional arrangements and their linkages across scales.	<ul style="list-style-type: none"> • Identify and describe current organisations, institutional arrangements and their linkages connected to the wetland • Identify the appropriate institutional arrangements for wetlands management. 	<ul style="list-style-type: none"> • Use, questionnaires, participatory mapping, PRA and interviews with key informants, focus group discussion etc. • Combine methods, including key informant interviews and focus group discussions, to identify appropriate institutional arrangements (combining formal and local including traditional structures)
Understanding ecosystem services provided by the wetland, to whom they accrue and their value (a lot of this information is derived from the ecological and socio-economic surveys)	<ul style="list-style-type: none"> • Identify the ecosystem services and quantify extent and distribution - temporal and spatial • Identify the beneficiaries – who/where & temporal variations • Implement suitable valuation methods to determine the value of ecosystem services 	<ul style="list-style-type: none"> • Map ecosystem services and relate to the land-uses and other socio-economic information (from above) • Determine trends in use and "quality" of ecosystem services (timelines identified from surveys, participatory techniques). • Determine the value of different services to different sectors of society (e.g. gender and wealth class differentiation) using one or a number of methods (for example multi-criteria analysis, cost-benefit analysis, and contingent valuation)

3.2 Cornerstone 2: A community-based monitoring and evaluation system which enables learning and support for adaptive responses from successes and failures

3.3.1 Relevance of the cornerstone

The purpose of a community-based monitoring and evaluation system is to support learning by the community in general and wetland users in particular through the provision of relevant information from management activities. The information from community-based monitoring should enable managers and wetland users make wetland management decisions based on knowledge of the success or failure of previous management activities. Community-based monitoring is an adaptive process that encourages wetland stakeholders to learn and improve from previous management activities. Technical experts from different agencies may assist in the design and implementation of the monitoring, but the emphasis is on local stakeholders making observations and interpretations in relation to their own needs and capacity. These activities can also facilitate links between local communities and technical organizations.

3.3.2 What do we want to achieve?

The strategies and processes for this cornerstone will support the collection of information about the wetland and its uses to support more informed decisions about interventions for sustainable use of the wetland. The monitoring and evaluation should be undertaken by the community and used to inform their decision making processes. Indicators of success include the engagement of community members in the monitoring and use of the information collected in making further decisions. The information must be relevant to local needs and available in a manner that can quickly inform local people who use and manage the wetland. It may involve capacity building and the exchange of information and expertise between local communities and technical organizations.

3.3.3 Possible actors and their roles

The main actors are members of the local community as well as external stakeholders (particularly downstream stakeholders) who will undertake the monitoring and evaluation. They can be supported by scientific experts from different organizations with specific skills in ecology, hydrology, socio-economic, and institutional analysis. The community will need to establish suitable structures to undertake the monitoring and evaluate the information that they collect and communicate this to those responsible for on-ground activities within the wetland. The scientific experts should assist with the design of the monitoring and its evaluation, provide training and support the overall capacity of the local community to monitor and make use of the information that they collect. In some instances they may also undertake specialist monitoring and assist with the maintenance of field equipment. The local community, other stakeholders upstream and downstream of the wetland, and technical experts should work together to identify those components of the wetland that need to be monitored in relation to the perceived risks from on-ground activities and the selection of management interventions.

3.3.4 Major issues and challenges that can be faced by wetland users

With increasing pressure on wetlands, through population growth and increased demand for food products both locally and for income generation there is an increasing need to address the limits of acceptable change and balance different uses. In many cases this may not be immediately apparent and could require expert advice in designing a suitable monitoring approach and assisting with technical advice on how to respond to the results. As the local community may not possess the capacity to undertake the necessary monitoring some realism about the level of monitoring is needed along with suitable capacity building. The key motivating factor for the local community will be the development of the capacity to undertake the monitoring themselves and to learn from their activities in a structured and community-wide manner. Technical organizations may need to support the

gathering and archiving of historical data for trend analysis, assist with integrating information from different disciplines, and seek resources (capacity and finance) for monitoring.

Another challenge is how to ensure that community members are actively involved in designing of monitoring as well as actual monitoring. This is essential for ensuring continuity of monitoring programs when external agencies are not present.

3.3.5 Promising strategies for community based monitoring and evaluation

The promising strategies cover five major elements:

- Establish a community-based monitoring network to identify existing local understanding and perceptions about wetlands and change in wetlands, motivate local interest in monitoring, and identify who in the community could participate.
- Develop a mechanism for evaluating data collected from key indicators of wetland “health” (ecological character) and benefits and management success and evaluate the success of management interventions through interpretation of data collected.
- Use information obtained from monitoring to learn and adapt wetland management interventions and assess how to modify management interventions to deal with change and increase the likelihood of sustainable use.
- Communicate findings to stakeholders in a way that provides useful information for adaptive management and justifies monitoring efforts.
- Identifying incentives for ensuring that monitoring continues

The different strategies of overcoming strategies identified for this cornerstone are detailed in Table 3.2.

Table 3.2 Elements of a community-based monitoring and evaluation system

Major elements	Key strategies and processes	Possible ways to implement
Establish a community-based monitoring network.	<ul style="list-style-type: none"> • Identify existing local understanding and perceptions about wetlands and change in wetlands • Motivate local interest in monitoring • Identify who in the community could participate in the monitoring and identify roles for the community and individuals. 	<ul style="list-style-type: none"> • Use participatory processes and questionnaires to identify issues and key individuals in the community. • Raise awareness within the community through multiple participatory processes and using locally relevant information wherever possible (see Ramsar guidance on local community involvement and raising awareness) • Build capacity within the community to conduct locally relevant monitoring (particularly in relation to instrumentation) as well as interpretation of data and reporting. • Identify appropriate incentives for local people to conduct monitoring • Develop an approach to mentor and support community-based monitoring
Develop a mechanism for evaluating data collected	<ul style="list-style-type: none"> • Identify key indicators of wetland “health” (ecological character) and benefits and management success • Evaluate the success of management interventions through interpretation of data collected from the monitoring network. 	<ul style="list-style-type: none"> • Identify local and technical relevance and ease of use of indicators for early warning and long-term trend analyses • Determine relevant targets for “success” and promote their adoption • Provide relevant feedback to all stakeholders (but particularly local communities) on the status and trends of agreed targets.
Use information obtained from monitoring to learn and adapt wetland management interventions	<ul style="list-style-type: none"> • Assess how to modify management interventions to deal with change and increase the likelihood of success (i.e. through adaptive management approaches) (see Ramsar guidance on management practices) 	<ul style="list-style-type: none"> • Use scenario based approaches to assess likely impacts (positive and or negative) and to develop alternate responses required.
Communicate findings to stakeholders in a way that provides useful information	<ul style="list-style-type: none"> • Communicate reasons for adaptive management and the needs for monitoring. • Communicate findings of monitoring and status and trends in key indicators evaluation 	<ul style="list-style-type: none"> • Develop communications strategies that provide information that is appropriate for local stakeholders and outsiders (see Ramsar guidance on communication)
Continuity of monitoring activities	<ul style="list-style-type: none"> • Identify incentives to ensure continued monitoring • Link adaptation, sanctions and incentives to the monitoring process 	<ul style="list-style-type: none"> • Identify incentives for long term monitoring

3.3.6 Community based monitoring

The framework and programme for monitoring changes in wetland health due to livelihood-supporting activities over time must be well integrated with the framework and programme for monitoring land-use and agricultural production. Thus, these respective frameworks need to be developed together. Monitoring programmes are developed through a two way process of interacting with those developing the monitoring programme for land-use and production. Furthermore, as highlighted below, a monitoring programme needs to be well informed by a baseline survey.

Box 3.2 Monitoring hydrology, ecology, and morphological features

A detailed baseline hydro-geomorphological description of the wetland is required as a priority. This should include a topographical survey, analysis of sediment profiles and a description of hydrological inputs and through-flow patterns and how these patterns are being affected by land-use patterns. This survey would provide the basis on which to inform the details of the monitoring that would be required for geomorphology and hydrology. Monitoring would include the following features.

- Seasonal description of the artificial drainage channel networks and other agricultural interventions
- The effect of the drainage channel network on the distribution and retention of water in the wetland.
- Water table in the wetland based on set of piezometers orientated along surveyed transects in the wetland
- The extent of artificial drainage networks
- Extent and intensity of sub-surface fires

Community based hydrological monitoring:

- Groundwater level monitoring using a dipstick implemented by a community member trained by the research team
- Recoding the number of days during cropping season and in dry season when water level is below a given level
- Monitoring river stage

At Missavene wetland in Mozambique, GaMampa wetland in South Africa, and Intunjambili in Zimbabwe, community members were trained to monitor depth to the shallow groundwater, and rainfall in the wetland. Communication on a monthly basis facilitated exchange of information and data between researchers and community based observers.



Water quality monitoring

Generally, water quality monitoring is an easily implementable exercise. However, it is difficult to include as part of community based monitoring due to the highly technical methods that are used. With relevant training for a community based field assistant, direct measurement of water quality parameters, including suspended solids, conductivity, and pH, can be carried out at community level. This can be used to complement more complex water quality parameters such as nutrients (nitrogen and phosphorous).

Vegetation monitoring

Observable features of wetland vegetation likely to change in the short term and that is easily observable and measurable at community level is the extent to which new croplands are developed within the intact vegetation areas in the wetland. This would provide a measure of the extent of the cumulative loss of the natural vegetation. Seasonal and annual records of such change can be easily kept at community level. This monitoring should be conducted at the same time (season) each year, for example in the middle of the dry season and again in the middle of the rainy season. Community monitoring of change of vegetation can be coupled with interpretation of high resolution aerial photographs, if available, and GPS-based field survey undertaken by researchers. It can provide reliable ground truth information.

3.3 Cornerstone 3: Technical management interventions to balance ecosystem functioning and human needs

3.3.7 Relevance of the cornerstone

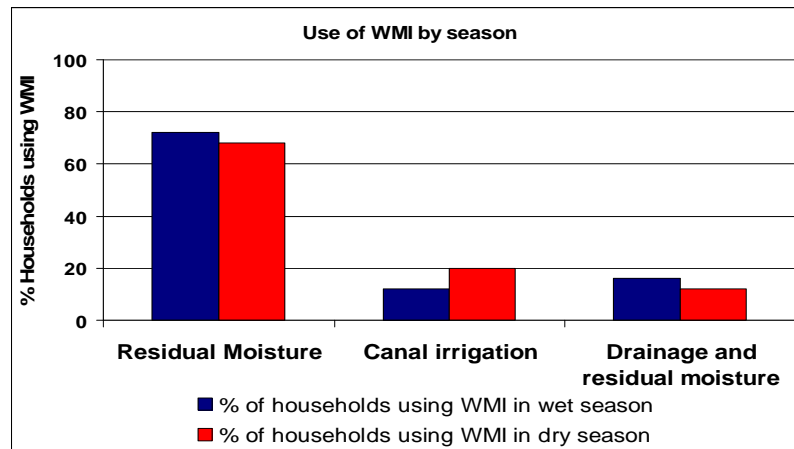
Technical interventions refer to the management of water and soils in the wetland. Technical interventions (of managing water, soil, crops etc) are a vital aspect of sustainable utilization of wetlands. Management of water for agriculture in wetlands is required in both dry and wet conditions. When the soil in specific spots in the wetland is dry, additional water from springs or wells is applied. Water is channeled to the dry areas in open channels, or buckets are used. In some cases the water table in the wetland is shallow and the root zone remains saturated; excess water is drained from the wetland. In other cases water is channeled in canals from springs in the wetland to irrigate areas outside the wetland.

The cornerstone should guide users on the selection of appropriate technologies and methodologies that will ensure a balance between conservation and productive use of wetlands. Wetland users are also assisted to identify livelihood options that they can explore to utilize the wetland while at the same time they are ensuring the protection of the ecosystem functioning. Boxes 3.3 – 3.5 show technical interventions that were in use at the case study sites in Mozambique, South Africa and Zimbabwe.

Box 3.3 Example of technical interventions in South Africa

The GaMampa wetland is a source of water for many purposes including drinking, crop production, and livestock watering. Most of the plots in the wetland have high moisture (due to presence of shallow water table) all year and require some form of water management intervention (WMI) such as drainage. Crop production in high moisture plots practiced all year but may require drainage. Some plots dry after rainy season end and may require irrigation. Drainage is most common agricultural WMI used.

WM Intervention	Infrastructure	Where used	Season	Comments
Direct use of residual moisture during dry or rainy season	None	Across entire wetland landscape	Wet or dry season	Main source of crop water; no irrigation infrastructure
Drainage	Open channel drains	Within 100m of the drainage channel (river)	Usually wet season	To lower water table to create suitable environment for crop Farmers need to be supported to avoid desiccation of the wetland
(Supplemental) Irrigation	<ul style="list-style-type: none"> ▪ Springs and shallow wells in the wetland ▪ irrigation canals from shallow wells and springs ▪ Flooded basins ▪ Small pumps (Pumping from shallow groundwater in wetland) 	In the transition zone between the wetland and the dry uplands	Dry season, but also rainfall season during in low rainfall years or during mid season droughts	Farmers need support for innovative interventions on efficient water use



Box 3.4 - Water Management Practices at Missavene wetland, Mozambique

The most common water management practice at Chibuto is irrigation from canals. It is practiced by more than 90% of farmers of the study area. The running water in the canals comes from the springs, rainwater as well as groundwater. Only farmers with plots located nearby the canal (0.5-1 m) are privileged. Farmers faraway from the canals make a kind of tertiary canal to divert water into their plots or into small dams from where they use containers or watering cans to irrigate their plots



Irrigation water from spring sources and diversions from springs

The second water management practice is direct irrigation from the springs. Under this water management practice mixed vegetables production viz. tomatoes, lettuce, onion, cabbage and carrots; bananas, sweet potatoes and sugar cane are main crops.

Since the furrow beds are oriented in the same direction of the water flow and the soils are in general poor-drained there is a high possibility of soils being washed during the irrigation events and therefore contribute greatly to soil degradation.



The third method is Flood Irrigation – Pumping Water from the canal is the third practice. Less than 1% of the total existing farmers occupying about 2 ha use this technique. The water is captured in the main canal and diverted into the plot (furrows or flood basins). This irrigation practice is mainly used during the wet season for rice and maize production. The limitation to adopt this technique is the huge amount of water required and the availability and accessibility of pumps to farmers.

The fourth practice is rice flooded basin. The water for rice fields comes from the groundwater and springs. Rice is produced during the wet season by the time the wetland area becomes flooded due to the observed rainfall events. During this time there is enough water to produce rice, thus water from the main canals nearby the fields is used to flood the rice basins.

Box 3.5 - Water Management Practices at Intunjambili wetland (Zimbabwe)

Water management interventions identified at Intunjambili wetland were classified by land use as follows: mixed vegetables irrigation direct from wells, flood irrigation of mixed vegetable from springs, flood irrigation of mixed vegetables from the stream and rain- fed wetland maize.

Irrigation of mixed vegetable gardens from wells is the most important water management intervention. Several small gardens form long narrow cultivated fields of varying sizes (6m x 1m) and (10m x 1.5m). Twenty-liter buckets are used to fetch water from shallow wells. Flood irrigation is used throughout the wetland. All the beds have raised side ridges to avoid escape of water from the fields. The gardens are located on a 1 - 2° slope. In some instances, beds are dug along the slope while the planting is done across. The use of 20-litre buckets is common amongst wetland users and is considered effective; however it is labor intensive.

The second intervention is irrigation direct from a spring by way of connecting a pipe at the source. The pipe connected to the spring allows the pressurized water to flow by means of gravity to the desired beds (Figure 3.4). In one garden 50% of the plot was being irrigated using water from a spring while the rest of the plot uses water from a well. The plot is located along the wetland spillway making it the wettest portion especially during summer when the water table is high. With this system, the farmer is able to grow maize throughout the year. Irrigation is done during the dry winter season while in summer the excess water is drained through furrow ridges dug between every two beds. The system is very effective in irrigation because it is less labor intensive and a large portion can be irrigated in a short space of time. The danger however is in over irrigating particularly the crops that are grown which are not necessarily water loving.

The third method is irrigation of mixed vegetables direct from the stream. This occurs when the gardens are located close to the streams. The garden is located 0-10m from the stream. Water is fetched directly from the stream with a 20L bucket to water an average plot size of 0.5 -1 ha. Each plot is characterized by an average total of 45 beds units approximately 7 m² in size. There is a high probability of soil erosion, leading to siltation as gardens are constructed very close to the water source. The human tracks constantly used to fetch water to and from the stream have a high probability of gully development in the long run.

The fourth intervention is rain fed wetland maize. Maize production is restricted to the summer period although an early plant which relies on residual wetland moisture is planted. Twenty liter buckets are used to water beds measuring on average 5m x 6m until the first rains are received. The practice is such that rain fed is produced in summer while residual moisture is in winter. Farmers need support to incorporate more innovative water management practices like early planting and ridge and furrow system.



Dug out well for irrigation



A pipe connected directly to a spring. Water flows by gravity to the desired bed.



Irrigation from stream

3.3.8 What do we want to achieve?

The aim is to develop guidelines on water and soil management interventions that ensure sustainable wetland utilization through maintenance of ecosystem services necessary for agricultural production. The guidelines are intended to give wetland users practical options for the utilization of wetlands, and to enable users to choose options that match their objectives, resources and technology level. These guidelines take into account the need to balance wetland utilization and conservation to ensure provision of key ecosystem services to users in the long term.

3.3.9 The possible actors and their roles

The main actors in wetland soil and water management interventions include communities directly who undertake crop production, livestock watering and grazing, and fishing etc. The development of the interventions by the community members should be supported by researchers from National Agricultural Research Centers, International Research Centers and Universities. Universities have also an additional role of ensuring that students are trained on the application of the interventions. Universities are in the unique position of being able to change future management of wetlands through introducing innovative wetland management concepts in teaching curricula. Agricultural Extension staff should be responsible for the dissemination of the interventions. The local and regional authorities that include the chiefs, headmen, the local councils, government departments directly involved in the administration and developing legislation of the wetlands that support the adoption of the interventions (Table 3.3).

Table 3.3 Key actors for technical interventions to balance ecosystem functioning

Actor	Role
Wetland resource users	Innovate / develop, and adopt the interventions
Universities, researchers, International Research and Knowledge centers	<ul style="list-style-type: none"> • Research leading to evaluation and further improvements of interventions • Innovate / develop, test appropriate interventions • Developing training material for users, researchers, policy makers, and environmental managers • Training to produce wetland researchers and environmental managers
Extension staff, NGOs	Disseminate appropriate interventions, facilitate wide adoption, and provide further technical support to wetland users
Local authorities	Enforce laws that support the adoption of appropriate interventions

3.3.10 The major issues and challenges

Some of the challenges pertaining to the management interventions are listed in Table 3.4.

Table 3.4 Challenges in implementing wetland management interventions

Issue / challenge	Example from case studies
Multiple uses (e.g. agriculture, ecotourism and the environment) whose management requirements may be in conflict,	<p>At GaMampa while there is no law prohibiting grazing in the wetland, livestock grazing can no longer take place in the wetland due to conflicting objectives.</p> <p>At Intunjambili the gardens are fenced to keep out livestock that would otherwise destroy crops.</p> <p>At GaMampa the value of natural products (reeds and sedges) have been diminished as the wetland is now used primarily for crop production</p>
Use of fertilizers, herbicides and chemicals for the production of crops that is likely to lead to pollution problems,	<p>At Missavene in Mozambique the use of fertilizer has resulted in water pollution (high nitrate levels in the water).</p> <p>At Intunjambili nitrate levels in water are low, but have been observed to be increasing</p>
Different management requirements of different crops e.g. some crops such as maize may be susceptible to water logging while others such as rice are water loving, and	<p>Drainage requirements for maize and vegetables limit crop choices. It is not possible to crop simultaneously crops that require high water levels such as rice.</p> <p>Drainage has resulted in change in natural vegetation.</p>
Prohibitive laws that tend to push wetland utilization away from the open agenda.	<p>Wetland issues not discussed openly.</p> <p>At Intunjambili agricultural extension staff have not been able to support farmers because of their poor understanding of the regulation (EMA). EMA 20:27 states that cultivation of wetland without a permit from the minister is not allowed. They therefore maintain the perception that it is illegal to cultivate wetlands. As a result, wetland cultivation occurs unsupervised / unsupported.</p>

3.3.11 Promising strategies

There are a number of promising strategies including:

- Development water management options that facilitate water distribution rather than water drainage. Such development will reduce opportunities for conflict.
- Development of crop diversification and intensification systems
- Development of weed and fertility management options
- Enhance capacity of farmers to match wetland use to their objectives and wetland conditions
- Create awareness of wetland management options and strengthen communities' capacity to make informed choices of wetland management technologies

- Strengthen extension services capacity to respond to farmer needs on wetland management interventions
- Strengthen communities and their organizations to demand services from government agencies (e.g. agricultural extension, water, environment)

To implement these strategies we suggest a number of strategies as detailed in Table 3.5.

Table 3.5: Strategies for overcoming challenges to having technical interventions to balance ecosystem functioning and human needs in place

Major elements	Key strategies and processes	Ways to implement
Appropriate technology	Development water management options that facilitate water distribution within the wetland rather than water drainage	<ul style="list-style-type: none"> ▪ Identification and assessment of indigenous knowledge on water management and elements which can be modified ▪ Design of water management options such as ridges/furrows, broad beds in farmers' fields ▪ Construction of water management options such as ridges/furrows, broad beds in farmers' fields ▪ Design and implement an operation and maintenance program of the field infrastructure ▪ Implementation of water retention options such as mulching
	Development of weed and soil fertility management options	<ul style="list-style-type: none"> ▪ Implementation of weed management options to minimize water loss ▪ Apply soil fertility management options that minimize loss of carbon and build up organic matter ▪ Use of cover crops that suppress weeds ▪ Selections of crops that are highly competitive against weeds. ▪ Use of leguminous crops to enhance soil fertility ▪ Design and implement a fertility management program that minimizes on pollution of the wetland
	Development of crop diversification and intensification systems	<ul style="list-style-type: none"> ▪ Assess and identify indigenous knowledge on the cropping systems and elements which need to be improved ▪ Identification, assessment and creation of awareness of market potential for other cash crops and advice on management of these crops ▪ Implementation of cropping systems such as rotations, cover crop, relay cropping ▪ Design appropriate cropping program for the specific wetland ▪ Together with beneficiaries implement the cropping program
Flexibility and adaptability of management interventions	Enhance capacity of farmers to match wetland use to their objectives and wetland conditions	<ul style="list-style-type: none"> ▪ Facilitate farmers to define their objectives and vision to improved wetland utilization dynamics ▪ facilitate farmers to understand wetland condition dynamics ▪ development and implementation of training program ▪ Develop exposure program such as farmer exchange visits ▪ Provide training materials to create awareness of different ways of modifying and adapting to management options.

Major elements	Key strategies and processes	Ways to implement
	Development of wetland Management plans	<ul style="list-style-type: none"> ▪ Define current management interventions and propose modifications. ▪ Identification of stakeholders & social mapping ▪ Participatory mapping of physical boundaries of the wetland ▪ Develop indicators to determine the impact of the intervention
Adoption and support services	Create awareness of wetland management options and strengthen communities' capacity to make informed choices of wetland management technologies	<ul style="list-style-type: none"> ▪ Demonstrations of wetland management options ▪ Testing of options in on- farm trials ▪ Farmer field schools and farmer experimentation ▪ Exposure to field options through exposure visits ▪ Develop and provide dissemination materials (posters, fliers, leaflets).
	Strengthen extension services capacity to respond to farmer needs on wetland management interventions	<ul style="list-style-type: none"> ▪ Provide training materials ▪ Organize and implement wetland management training ▪ Mobilize resources for extension staff for the provision of wetland management support ▪ Lobby for policy that supports extension staff to provide extension advice on wetland management.
	Strengthen communities and their organizations to demand services	<ul style="list-style-type: none"> ▪ Create awareness of sources of support ▪ Strengthen communities to articulate demand for services ▪ Facilitation of inclusive groups ▪ Create awareness on quality service

3.4 Legal frameworks of different actors and levels which are coherent and encourage sustainable use

3.4.1 Relevance of the cornerstone

Sustainable management of wetlands depends on having in place enforceable mechanisms, in the form of a legal framework, for regulating how the wetlands are used. Ideally the legal framework should reflect both the physical characteristics of the wetlands as well as the community and society in which they are found. This means recognizing that wetlands are used by different actors (for example women, youth, men), for different uses such as domestic water supply, cultivation and livestock grazing. All these uses have to be reconciled among themselves and also in relation to other ecosystem services that the wetlands provide. Consequently an effective legal framework governing wetland use should reflect the fact that wetlands are:

- Nested within a larger landscape and hydrological system although different scales are recognizable (wetlands are part of local catchments and river basins),
- Used by different actors (for example women, youth, men), for different uses such as domestic water, cultivation and grazing,
- Part of a larger society as they may be used by people that hail from one part of a village, one village, more than one village,

- Sources of various biological resources, and are therefore important sources of biological diversity
- Usually managed under common property resource arrangements (referred to commons) as they are used by more than one person, and
- Fragile ecosystems and hence the interest of the state to balance individual and public interest.

Considering the three countries from which the case studies in this study were based, there is a significant gap between policy and local management of wetlands. Legislation governing wetland use varies from country to country because of the specific historical context of each country. In some countries wetlands are regulated by more than one piece of legislation (see Box 3.6). This tends to create confusion on the ground, among both wetland user and natural resource managers.

Box 3.6 History of wetland legislation in South Africa and Zimbabwe

South Africa

Legislation in South Africa recognizes legal pluralism and affirms the importance of customary law. The Constitution recognizes the right of a healthy environment for the benefit of all citizens and future generations (Constitution of RSA, Act 108 of 1996). Chapter 12 and section 211 of the South African Constitution recognizes the institution, status and role of traditional leadership according to customary law. Section 211 (2) establishes the authority of statutory law over customary law and entitles the legislature to repeal, amend or replace any existing customary law.

South Africa ratified Ramsar Convention in 1999 and is a signatory to the convention. It however, does not have a national level policy concerning wetland use and conservation but a focal point of wetland management in the shape of the South African national Biodiversity Institute. South Africa has established Ramsar sites in line with internationally recognized criteria. It has also ratified the Convention of Biodiversity, United Nations Convention to Combat Desertification, the United Nations Framework Convention on Climate Change, and the Bonn Convention.

Laws and policies regarding wetlands are fragmented and covered by different sectors. Key laws governing wetlands are the National Water Act (Act 36 of 1998), the National Environmental Management Act (Act 107 of 1998), the National Environmental Management: Biodiversity Act of 2004, the Environment Conservation Act (Act 73 of 1989) and the Conservation of Agricultural Resources Act (CARA) 1983 that is soon to be replaced by the Sustainable Utilization and Protection of Agricultural Resources (SUPAR) Act.

The laws can be categorized as those that:

- restrict wetland use (National Water Act, National Environmental Management Act and Environmental Conservation Act),
- foster and control the wise use of wetlands (National Environmental Management : Biodiversity Act)
- regulate an aspect of their use like controlling cultivation and erosion (Conservation of Agricultural Resources Act).

Despite the current legislation, wetland cultivation occurs in some areas.

Zimbabwe

Zimbabwe ratified the Ramsar convention but is still to become a signatory to the convention.

In Zimbabwe the law governing the use of dambos, the local term for wetlands, can be traced back to the Environmental management Act of 1926. This law prohibits stream bank cultivation, including cultivation in dambos. The natural Resources Act of 1952 prevents the use of dambos for agriculture (Whitlow, 1983). The Natural Resources Act that was based on experiences on commercial farms where degradation of some wetlands occurred due to cultivation and drainage practices. However, grazing was allowed on the basis that it was safe but was proved to be just as degrading if not more than cultivation.

Despite the legislation wetland cultivation has continued in the communal areas. In 2002 the Environmental Management (EMA, 2000) Act was passed. This Act allows cultivation of wetlands in certain instances. In such cases, a permit should be granted by the minister. As such, such use of wetlands is registered.

State-defined pieces of legislation (known as statutory law) have tended to be dominant regarding how wetlands should be used, at least in the public discussions. However, in practice statutory law is not the only legislation that govern wetland utilization and management. Wetlands, as is the case with other common property resources, tend to be governed by more than one legal framework, a phenomenon referred to as legal pluralism (Meinzen-Dick, et al, 2004). Legal pluralism is defined as the presence in a social field of more than one legal order (Griffiths, 1986). It therefore contradicts the notion that the law is a single, monolithic, unified set of rules flowing from a state hierarchy. Legal

pluralism can encompass many forms³ and phases but the most common consists of a dual structure (Chiba, 1998). This is reflected in the legal pluralism literature focused on customary laws, tribal laws, and social laws working within state law in a dual structure mainly in non-western countries. Lack of appreciation of legal pluralism, referring to the fact the wetlands are governed by more than one legal framework, is perhaps the most single causal factor behind lack of sustainability in the way wetlands are utilized and managed. Understanding legal pluralism is a pre-requisite for appreciating how property rights, which define how people interact over the resource with regards to how people gain access to and wield control over wetland resources, are arranged. Property rights should be understood as bundle of rights that deal with control or decision-making rights, and use rights over different resources.

Problems arise when the state imposes legislation defined without the involvement of community members and in the process ignores customary/traditional, religious or project law, which, in some cases, are equally if not more important than statutory law. While by definition legal frameworks are largely prescriptive in that they prescribe certain behavior, they do not determine behavior but only influence it. Thus the effectiveness of the legal framework is determined by the degree to which it approximates the expectations of the actors. This underlines the need to put in place effective institutional arrangements (see below). In wetlands the law operates at local level i.e. within the wetland and its hinterland, within local governmental structures, within nationally-defined parameters, and takes cognisance of international provisions.

Understanding legal pluralism in wetlands is a pre-requisite for appreciating how property rights are configured. Property rights define how people interact over the resource with regards to how people gain access to and wield control over in the wetland. Property rights should be understood as bundle of rights that deal with control or decision-making rights, and use rights (Meinzen-Dick, 2004). This means that while individual farmers can have control rights over the crops they grow on their plot they may have only use rights over the land, which may fall under the control of a traditional leader. Wetlands are generally *indivisible* in both physical and social terms and yet *subtractable* in the sense that action of some individuals can have consequences on wetland services. There is therefore a need for appropriate legal frameworks that promote collective action so that, wetland users achieve mutual good. To this end mechanisms must be found to discourage “free-riders” who want to draw benefits without owning up to their responsibilities.

3.4.2 What do we want to achieve?

This cornerstone seeks to enhance the appreciation and understanding of the various multiple legal frameworks in wetlands in order to:

- unravel the nature of the coexistence with a view to craft better interventions where desired, which will improve legitimacy of the institutions governing wetlands use,
- Achieve consistence and coherence in the application of the laws concerned,
- Ensure fairness and equity in the way wetlands are used and managed, and
- Reduce conflicts that are likely to result from imposed alien concepts on the users.

3.4.3 Who are the possible actors and their roles

There are a variety of actors involved in wetland management at local, national, and international levels (Table 3.6). Because wetlands are a confluence of many resources, namely land, water,

³ Tay and Tan distinguish six forms of legal pluralism. 1. The global perspective: many legal cultures; 2. the national perspective: legal pluralism within each society; 3. legal pluralism recognized by, and within, a legal system; 4. legal pluralism through recognition of personal law; 5. plurality of individuals, institutions and interests; 6. legal pluralism of open-ended concepts (Tan 1997, 396–403). Quoted in (Chiba, 1998)

biological resources, there are potential areas of conflict as the resources are regulated by different legal frameworks.

Table 3.6 Roles and responsibilities of various actors in relation to wetland management

Level	Actors	Role
Wetland	Various users (domestic water users, farmers, brick-makers etc), and local leadership (traditional and elected)	Designing and upholding local law governing land, water and biological resources
Wetland hinterland	Rain-fed farmers and other resource users, traditional leaders	Designing and upholding of catchment-wide law including catchment management and how water will be allocated
National level	District councils / local government	Land authority responsible for land allocation
	Line ministries	Set policy framework within their given mandates,
	National bodies responsible for environment issues which may be decentralized (e.g. Environmental Management/Protection agencies)	Has oversight of use of environmental resources and spearheads development of appropriate policies and laws at the local, district and national level
International level ⁴	Inter-state parties	Provide internationally recognized management principles for management wetlands, which national government have to adopt

Box 3.7. Organization of wetland legislation at local level: the case of Intunjambili wetland, Zimbabwe

At Intunjambili, wetland management is regulated by the Environmental Management Act (Chapter 20:27) that states that “no person shall, except in accordance with the express written authorization of the Environmental Management Agency, given in consultation with the Board and the Minister responsible for water resources, disturb any wetland by drilling or tunneling in a manner that has or is likely to have an adverse impact on any wetland or adversely affect any animal or plant life therein, or introduce any exotic animal or plant species into the wetland”. All the activities being carried out at the site including brick molding, livestock grazing and cropping contravene sections of this act. The act suggests that community members can get “written permission” from the Minister responsible for water. However, the process for obtaining this permission remains obscure. The community and the support agencies (agricultural extension officers and workers as well as environmental officers) are not conversant with of the process. There is also generally no capacity to enforce this act and as a result whether the management of the wetland is sustainable or not is left to the discretion of community members. At Intunjambili, according to the community members, before this research no one had ever assessed their practices or checked if they have permission to use the wetland the way they are doing. Finally while there is a fine or penalty stipulated in the Act to be instituted against those that contravene the Act, this fine or penalty appears too low to be a deterrent.

⁴In southern Africa Botswana, Democratic Republic of Congo Lesotho Madagascar, Malawi, Mozambique, Namibia, South Africa, Tanzania, and Zambia are signatories to the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention or Wetlands Convention) that was adopted in Ramsar, Iran in February 1971 and entered into force in December 1975. It is, however, not clear to what extent this convention has guided or influenced wetland use in the different countries.

Box 3.8. Organization of wetland legislation at community or local level in Zimbabwe and South Africa

In South Africa the laws and policies regarding wetlands are fragmented and covered by different sectors. The Constitution recognizes the right of a healthy environment for the benefit of all citizens and future generations (Constitution of RSA, Act 108 Of 1996). Key laws regarding wetlands are the National Water Act (Act 36 of 1998), the National Environmental Management Act (Act 107 of 1998), the Biodiversity Act of 2004, the Environmental Conservation Act (Act 73 of 1989) and the Conservation of Agricultural Resources Act (CARA) (1983). In general, different laws fall under the categories of those which restrict wetland use (NWA, NEMA, ECA), foster and control the wise use of wetlands (NEMBA), or regulate an aspect of their use like controlling cultivation and erosion (CARA).

Legal and policy instruments in use by different sectors may be contradictory given a lack of harmonization. An example may be the CARA Act (1983) under which wetland ecosystems were opened for cultivation to large-scale commercial farmers. As a result of this policy, "large portions of wetlands were drained in some of the main catchments of the country, without serious consideration of the maintenance of ecosystems services. CARA further downplayed sustainability issues and only focused on erosion control" (policy analyst). In some respects the CARA contradicts the NEMA, which emphasizes wise use and sustaining overall ecosystem health.

Currently in South Africa the National Water Act 1998 (NWA) is viewed as the strongest and the most idealistic piece of legislation for water resources management regarding the principles, it intends to defend.¹ Other relevant laws include the Mountain Catchments Areas Act, 1970 (Act 63 of 1970), the National Forest Act, 1998 (Act 84 of 1998), the National Heritage Resources Act, 1999 (Act 25 of 1999), National Parks Act, 1976 (Act 57 of 1976), National Veld and Forest Fires Act, 1998 (Act 101 of 1998), the Promotion of Access to Information Act, 2000 (Act 2 of 2000), and the Promotion of Administrative Justice Act, 2000 (Act 3 of 2000).

Some of the weaknesses of current South African wetland policy and practice:

1. The "dispersed mandate for [wetland] management and sustainable use" as one policy analyst, policy and program implementer said, is because a number of governmental institutions are involved in conservation and management of wetlands, each in its own sphere of expertise with their own vision. It is difficult to reconcile the different perspectives.
2. "Weak collaboration between sectors, lack of synergy in coordination, duplication of efforts, misallocation of resources" (policy analyst) are inherent in implementation of different policies. The Government is "divided into spheres over the principles of autonomy and interdependence [that] emphasizes the principle of collaboration" (policy and program implementer). However, collaboration is not always effective in practice as "the implementation of policies plans and programs occur at the level of a specific sector and with the principle of autonomy, none of the sectors are under or above one another" (Ibid).
3. At provincial scale, "availability of resources makes the differences from one province to another. For example a rich province like the Western Cape has the possibility to implement a program without systematically referring to the central government" (Ibid). This freedom has advantages and drawbacks, depending on how principles and processes are respected, and the quality of outcomes. One result of differences in funding among provinces is that the "central government is more involved in less rich provinces and consequently disposed of a larger margin of influence and control" (Ibid).
4. The agricultural extension officers who work closely with farmers are not all trained in sustainable use of wetlands. The current tendency is "whatever crops a farmer wants to produce the extension officer just endorses and provides information regarding these crops without a further consideration of the ecological conditions of the ecosystem" (Ibid). Since extension officers are the closest technological link to communities, this situation does not promote the sustainable use of wetland resources.

3.4.4 Major issues and challenges

The challenges associated with the multiple legal frameworks that operate at different levels are often encountered at implementation. The major drawbacks relate to

- Entrenched practices top-down approaches in formulation and implementation of national legislation
- International and national law that remain too abstract for local reality,
- Lack of capacity at national and local government level to effectively formulate as well as implement declared policies,
- Poor appreciation and definition of physical and social boundaries as reflected by alienation of rain fed farmers and other catchment users from participation in issues relating to wetlands, and

- Weak, if not absent, coordination of various actors resulting in conflicting policies and practices.

3.4.5 The promising strategies

Table 3.7 shows some of the important promising strategies that can be used to address the identified challenges.

Table 3.7 Major elements, key strategies and processes, and possible ways to implement viable legal framework

Major Elements	Key strategies and processes	Possible ways to implement
Variety of legal frameworks and their (inter)linkages	Identification and analysis of existing legal frameworks for particular wetlands, and how these can be implemented to obtain maximum ecosystem services	<ul style="list-style-type: none"> - Stakeholder identification of normative and practiced legal frameworks - Group discussion on the strengths and weaknesses of different frameworks for ecological and livelihoods requirements
	Understanding the basis of different legal frameworks and their suitability to local wetland use practices	<ul style="list-style-type: none"> - Group-facilitated analysis of the background and objectives of various legal frameworks - Participatory assessment of existence and applicability of supportive systems (subsidiary legislation, institutional environment, and finances) - Participatory assessment of potential areas of conflict and cooperation - Participatory analysis of how communities combine different elements to their best advantage (forum-shopping) - Consensus building on desirable elements that can be incorporated into local practices
Durability of customary law	How local people and change agents have relied on customary law to safeguard local interests and the wetland system	<ul style="list-style-type: none"> - Stakeholder identification of customary rules that can be used in terms of rationale and effectiveness - Stakeholder analysis of the limitations of customary law

3.5 Cornerstone 5: Locally negotiated rules and by-laws which discourage unsustainable use of wetlands

3.5.1 Relevance of the cornerstone

The general legal frameworks outlined section 3.1 should ideally lead to locally negotiated rules on how wetlands are used. This is because state-formulated rules and by-laws relating to wetland use, however technically sound, cannot by themselves prevent unsustainable use of wetlands. The promotion of community natural resource management (CNRM) approaches in such resources as forestry and fisheries indicates a paradigm shift in the way the state has viewed the role local people can play in the management of common pool resources. As a consequence some form of decentralization of the management of resources has occurred. This can be applied to wetlands as well. Some of the disappointing results that have characterized CNRM approaches have been due to approaches that do not give local people real decision-making power. Genuine approaches that open up space for local people to negotiate rules and by-laws that regulate different wetland users and uses

are therefore a must. However, rules and by-laws are merely the ‘rules of the game’ and not the ‘state of play’ in terms of how actually things are done in practice. Nevertheless rules and by-laws provide a normative framework regarding how things should be done. This forms a good basis for consensus to be reached and for conflicts to be avoided or prevented.

3.5.2 What do we want to achieve?

The strength of locally negotiated rules and by-laws is that they have a greater legitimacy locally, and stand a better chance of being observed locally than national level legislation. The process of negotiation not only leads to consensus building, which in the long run will make conflict management an easy task. It can also result in the creation of new relationships and partnerships between community members and service providers (e.g. between resource users and government agencies implementing rules and by-laws). The outcomes of the implementation of rules pertaining to the critical issues include (Ostrom, 1992)

- clearly defined physical and social boundaries
- congruence between appropriation and provision rules and local conditions
- collective-choice arrangements allowing for the participation of most of the appropriators in the decision making process
- effective monitoring by users and other actors so as to create transparency and accountability
- graduated penalties for users who do not comply with rules
- conflict-resolution mechanisms which are accessible to all users
- minimal recognition of different rights to organize by all actors
- recognition of multiple layers of nested enterprises

3.5.3 Possible actors and their roles

Actors that are important in negotiating local rules and by-laws are the various users of wetland resources and those who wield power and authority over the resource. The actors that are important can be classified in five categories, namely

- Local resource users (e.g. cultivators, domestic water users and fishermen),
- Upstream resource users in the catchment,
- Downstream resource users, including farmers and other water users who may be affected by uses in the wetlands upstream,
- Community/traditional leaders whose influence can increase chances of succeeding in negotiations, and
- Change agents (such as facilitators and financiers) critical to ensure that local people engage in effective dialogue and negotiation about the rules and by-laws.

3.5.4 Major issues and challenges

Devising local rules and by-laws that can promote sustainable wetland use faces a number of challenges including

- Approximate compliance as opposed to full compliance for example cases where there is failure to completely enforce rules for fear of witchcraft or other powers
- Low locally negotiated penalties such that the penalties do not have the deterrent effect they are intended to have. An example is poor fines for failing to observe harvesting procedures such as cutting reeds as opposed to digging them out or fishing methods (nets or lines) and observing fishing seasons.
- Undermining of locally negotiated rules and by-laws around conflict resolution by modern conceptions of conflict management

- Lack of incentives that fail to stop the free-rider mentality where people can continue to derive benefits from common pool resources without necessarily contributing to their sustainable management
- Long standing rivalry and conflicts between stakeholders (e.g. the case of GaMampa wetland)
- Unequal power relations, also known as power asymmetries. This has the net effect of undermining the negotiated rules and by-laws and disadvantages the users with less power.

Box 3.9. Unequal power relations in wetland uses for livelihoods: observations from case studies

At one wetland, one farmer claims to have more rights and does as he pleases as he was the first farmer to settle in the area and was responsible for the development of the irrigation system.

At another wetland, one farmer abstracts as much water as he likes from a common reservoir because he has a pump. Other users in the community seem powerless to challenge this use.

3.5.5 The promising strategies

Despite the challenges facing the design and implementation of locally negotiated rules and by-laws it is possible and desirable to make them succeed. For this to happen it is important that the negotiations tackle critical issues relating to

- property rights regimes that are and need to be in place,
- Penalties that fit the severity of the offence that has been committed, and
- Conflict resolution mechanisms that are based on a balanced “carrot and stick approach”.

These should be complemented by plans that take into account local conceptualization of the issues, such as what is meant by but not limited to sustainable use of wetlands, negotiation, and penalties. Development and implementation of these plans should be through active participation by all stakeholder groups. Effective stakeholder participation is important and can only be realized if facilitators of this process are sufficiently diligent to avoid the common pitfalls of stakeholder participation (see section 3.6). Table 3.8 shows some of the major aspects that need to be addressed.

Table 3.8 Major elements, key strategies and processes, and possible ways to devise locally negotiated rules and by-laws

Major elements	Key strategies and processes	Possible ways to implement
Property rights regimes	Identification and discussion of bundle of rights dealing with rights of different groups to access and control of wetland resources that incorporates traditional, statutory and international law	<ul style="list-style-type: none"> • Participatory assessment of different wetland uses and the related rights of different users • Facilitated negotiations over priority of use and options available • Consensus building on viable institutional arrangements

Major elements	Key strategies and processes	Possible ways to implement
Graduated penalties	Identify sanctions provided by different frameworks including the traditional, local authority by-laws and environmental & water legislation	<ul style="list-style-type: none"> List the penalties Discuss advantages and disadvantages Agree on appropriate penalties
	Promote comprehensive enforcement framework incorporating traditional, statutory and local authority by-laws	<ul style="list-style-type: none"> Undertake an inventory of available enforcement mechanisms Institutionalize incentivized community policing Ensure community policing Liaise with other agencies (local authority, traditional leaders, environmental agents, and police) Ensure payment of deterrent fines
Conflict resolution	Application of existing and other conflict resolution mechanisms	<ul style="list-style-type: none"> Identify issues around control, access and use Assess effectiveness (cost-effective and timeliness) of conflict resolution mechanisms through focus group discussions Discuss and agree on appropriateness of enforcement mechanisms
Local conceptions of unsustainable uses and negotiations	Identification and application & basis of the concept of unsustainable use and negotiation	<ul style="list-style-type: none"> Facilitated stakeholder group discussions Consensus on application of the concepts

3.6 Cornerstone 6: Agreed-upon and functional institutional arrangements which facilitate and regulate sustainable wetland utilization and conservation

3.6.1 Relevance of the cornerstone

Institutions are defined as social arrangements that shape and regulate human behavior, have some degree of permanency and purpose, and transcend individual human lives and intentions (CAWMA, 2007: 196), and are made up of the *institutional environment* and *institutional arrangements*. Institutional arrangements refer to the structure that humans impose on their dealings with each other (hence the reference to the state of play) while institutional environment refers to the “rules of the game”, that could be formal and explicit (constitutions, laws etc) as well as informal and implicit (norms, customs). Often the word institution is used interchangeably with the word organization, which refers to formalized institutionalized arrangements that have a structure and have defined roles. It is therefore necessary not to confuse institutions with organisations.

Institutions are interpreted differently by different people. This underlines the importance of analyzing how things are done in practice. This may lead to the identification of rules that are frequently broken, and why this is so. By appropriately defining institutions it is possible to lay a foundation for crafting institutional rules of engagement that are out of context and prescriptive.

3.6.2 What do we want to achieve?

In crafting agreed-upon and functional institutional arrangements the aim is to:

- establish viable rules-in-use that can help to achieve sustainable wetland utilization and conservation;
- understand the notion of multiple realities that characterizes wetland use, which cannot be wished away by imposing the reality of certain groups of actors;
- understand the normative (written and unwritten) rules that apply and adapting the normative framework so as to make it more relevant to local realities if necessary.

3.6.3 Relevance of the cornerstone

Actors that are important in negotiating local rules and by-laws are the various users of wetland resources, as well as the appointed authority and power brokers. As is the case with locally negotiated rules and by-laws, the actors that are important can be put in five categories, namely:

- all stakeholders, internal and external to the wetland
- facilitators to ensure that all stakeholders engage in effective dialogue and negotiation about the rules and by-laws.

3.6.4 Major issues and challenges

The challenges faced in the design of viable institutional arrangements are:

- Entrenched and vested interests can stand in the way of coming up with institutional arrangements,
- Negative or prohibitive existing statutory laws,
- Conflicting local institutional arrangements, and
- A disconnect between what people do and what people say in practice (which underscores the importance of good facilitation)

3.6.5 Promising strategies

Table 3.9 captures some of the topical issues that need to be addressed and the related strategies.

Table 3.9: Major elements, key strategies and processes, and possible ways to achieve agree upon and functional institutional arrangements

Major Elements	Key strategies and processes	Possible ways to implement
Variety of institutional arrangements	Identification and understanding of the use of different institutional arrangements in relation to bio-physical and ecosystems functions & socio-economic environment	<ul style="list-style-type: none"> ▪ Facilitated stakeholder discussion across different groups (men/women, youth/elderly, rich/poor, traditional/elected leadership) in terms of effectiveness and appropriateness ▪ Consensus on viable institutional arrangements
Empowerment	Use of social learning methodologies to identify viable institutional arrangements	<ul style="list-style-type: none"> ▪ Facilitated identification of possible sites ▪ Field visits to the sites ▪ Look-see visits to draw important lessons

3.7 Cornerstone 7: Incentives to encourage maintenance of ecosystem services

3.7.1 Relevance of the cornerstone

Ecosystem services provided by wetlands are often lost as a result of mismanagement and lack of incentives to preserve them. Rural communities often attach more value to short term payoffs that

satisfy their immediate income and food needs resulting in over-exploitation of wetland resources. In the long-term, the capacity of wetlands to provide services is undermined and the welfare of those dependent on wetland resources for their welfare is also adversely affected. A strategy that links with sustainable management of wetlands to improved livelihoods at the onset is essential for providing an incentive for long-term maintenance of ecosystem service. There is need to identify explicit entry points to ensure that wetland users have some form of incentives to use wetlands in a sustainable manner (e.g. new knowledge, improved access to markets, improved agricultural technologies).

Different wetland management interventions generate a variety of ecosystem services. For example, a wetland management intervention which involves preservation of the natural vegetation can help maintain downstream water flows and reduce the risk of water shortages downstream. However, if the wetlands users do not receive any compensation for such ecosystem services, they ignore them in making their wetland management decisions, often leading to decisions that are socially sub-optimal. However, if the wetland users are compensated for the environmental services they generate they have a direct incentive to include these services in their management decisions resulting in socially-optimal wetland management interventions.

Box 3.10: Ecosystem services provided by Intunjambili wetland, Zimbabwe, major threats, opportunities and incentives for maintaining ecosystem services

- The Intunjambili wetland provides diverse provisioning, socio-cultural and ecological services which support the livelihoods of the surrounding community. Due to its ability to retain water throughout the year, the wetland support agriculture through provision of water for irrigation of maize, groundnuts, green beans, leafy vegetables and fruit and gum trees during the dry season. Livestock grazing and watering is also supported by the wetland system. The wetland is also rich in diverse flora and fauna species. Other goods and services provided by the wetland include: Fresh water for domestic uses like drinking, washing and bathing.
- Building materials in the form of reeds and poles
- Edible wild plants and insects
- Medicinal plants
- Fishing and recreational services
- Fuel wood
- Arts & crafts materials
- Cultural use by providing burial ground for children
- Ecological Services such as water recharge and discharge, flood attenuation

Threats to the integrity of Intunjambili wetland

Despite its importance for human livelihood, the wetland faces several threats to its ecological integrity. The main threats are:

- Clearing of wetland natural vegetation for vegetable gardens and field crop production that has resulted in loss of biodiversity
- Overgrazing
- Soil erosion resulting in siltation in water sources
- Poor quality as a result of use of inorganic fertilizers by some farmers
- Loss of biodiversity of terrestrial and aquatic life
- Dilapidated recreational services and fishing services

Opportunities and Incentives that reduce degradation of Intunjambili wetlands

There are several opportunities reducing degradation of the wetland through provision of incentives to conserve wetland ecosystem services. Examples of opportunities and possible incentive mechanisms include

- Raising farmer awareness on the environmental threats to the wetlands and better wetland management options
- Establishment of an all inclusive local level village wetland committee responsible for regulating and managing wetland activities. The committee should have representatives from all stakeholders including farmers, community leadership, extension agencies, Environmental Management Agency (EMA), University of Zimbabwe (UZ) and Non Governmental Organizations represented in the area. The wide representation in the committee will help create a platform for dialogue and consensus building among the stakeholders with different interests in the wetland
- Broadening people livelihood options through:
 - Rehabilitation of the eco-tourism centre and resuscitation of recreational activities like fishing and boating can potentially generate income for the community
 - Introduction of appropriate incentives that promote widespread adoption of conservation management practices e.g.
 - Promote the use of more environmentally friendly soil fertility management practices such as conservation farming and other organic fertilizers
 - Introduce rotational grazing (paddock system) and livestock watering points outside the wetland to minimize the effects of livestock grazing on the wetland
 - Integration of wetland management programs into the broader rural development programs such as programs aimed at improving access to credit markets, improved access to high yielding varieties, better access to extension and strengthening of farmer market linkages

Box 3.11: Ecosystem services provided by GaMampa wetland, South Africa, major threats, opportunities and incentives for maintaining ecosystem services

The GaMampa wetland provides several ecosystem services, most notably:

- Provisioning (crop production, livestock grazing and watering, edible plants)
- Domestic water supply
- Building materials (reeds)
- Arts and craft materials (sedge)
- Fuel wood
- Arts & crafts materials
- Regulating services such as water recharge and discharge, erosion control, carbon storage

Major threats to the wetland ecological integrity

Despite its importance for human livelihood, the wetland faces several threats to its ecological integrity. The main threats are:

- Clearing of wetland natural vegetation for crop production resulting in changes in hydrological responses from the wetland area
- Livestock grazing pressure
- Artificial drainage of wetland water
- Depletion of soil organic matter
- Soil erosion
- Invasion by alien plants

Opportunities and Incentives to reduce loss of ecosystem services in GaMampa wetland

The major underlying economic cause of loss and degradation of the GaMampa wetland is insecure livelihoods or limited livelihood opportunities among the local population due to limited sources of income and food mainly as a result of breakdown of the irrigation infrastructure and recurrent droughts. In light of this, broadening the livelihood options for the local population is seen as an effective strategy for providing incentives for maintaining wetland services. Some of the proposed incentives for maintaining ecosystem services in this wetland are:

- Rehabilitation of the dysfunctional irrigation schemes
- Promotion of ecotourism and resuscitation of the ecotourism centre
- Establishment of new markets for wetland products and value addition for wetland products
- New markets for off-farm income activities such as brick-making
- Promote use of water conservation technologies upstream

3.7.2 What do we want to achieve?

The aim of this cornerstone is to enhance the commitment of wetland stakeholders to long term sustainable management of wetlands through provision of incentives that encourage maintenance of wetland ecosystem services. All stakeholders (researchers, extension workers, NGOs, environmental agencies) should aim at identifying entry points that provide such incentives and be able to organize this as part of the organizational management and change process. Further, it is important to identify incentives and entry points or mechanisms that will not result in community dependence. Equally important is the linking of incentives to sanctions and penalties for non-compliance to locally agreed rules and by-laws (see Section 3.5).

3.7.3 The possible actors and their roles

The key actors are all stakeholders including those in the wetland, and upstream and downstream of the wetland. These are community wetland users (crop farmers, livestock farmers, gatherers of natural products), local community leadership, downstream and upstream stakeholders who benefit or affect the provision of ecosystem services by the wetland; researchers, extension workers and officials, NGOs, and environmental agencies (public and private).

As the ultimate participants and beneficiaries of possible incentive schemes, communities should identify different entry points and incentive options (welfare needs) for maintaining ecosystem services. Researchers should identify entry points that provide incentives for management of wetlands. In addition, researchers in consultation with other stakeholders should identify different wetland management options that help maximize the identified incentives from the wetland(s) without undermining the ecological integrity.

The role of agricultural extension agencies is to work in collaboration with research institutions, NGOs, environmental agencies, and communities to create and enhance awareness of the values of direct and indirect services of wetlands among local communities and management options. The role of Environmental Management Authorities, catchment management authorities, and local community leadership is to create and enhance awareness of the regulations and enforce implementation of sanctions and penalties against offenders.

Finally there is a role for funding agencies to identify sustainable mechanisms of providing (initial) direct investment in for the identified incentive schemes. Possible funding could be from the government and development agencies.

3.7.4 The major issues and challenges

Due to limited resources rural communities are often unable to invest in sustainable management of natural resources unless there is an incentive to do so. They therefore tend to have short term perspectives and value more immediate needs. Engaging rural communities in long-term change processes, particularly when it requires significant investment and when the payoffs are not initially visible is a major challenge. Another challenge is that of ensuring that short terms incentives do not create community dependency. There may be need to find strategies to deal with external (outside your control) causes of dependency. Maintaining research activities while trying to support (and justify this activity in research organization context) more development type incentive can be a major challenge. It takes skill and resources to manage entry points at the same time pursuing other research objectives.

3.7.5 Promising strategies

Some of the promising strategies are presented in Table 3.10.

Table 3.10 Promising strategies relevant related to providing incentives to encourage maintenance of ecosystem services

Major Element	Strategies	Ways to implement
Economic valuation of wetland goods and services and their distribution	Create awareness of the economic value of wetland goods and services among local communities including both direct and indirect services of wetlands	<ol style="list-style-type: none"> 1. Conduct stakeholder analysis to identify the different stakeholders involved in using wetlands and their perceptions on the importance of services provided by the wetland 2. Identify the different wetland ecosystem services people derive from wetland ecosystem services 3. Quantify the value of wetland ecosystem services through economic valuation studies economic instruments 4. Analyze the distribution of benefits and costs of wetland services among stakeholders
Trade-offs among ecosystem services	Create awareness among local communities and decision-makers (government agencies, development planners and policy makers) of the impacts of alternative wetland management interventions on wetland ecosystem functioning,	<ol style="list-style-type: none"> 1. Understand the potential trade-offs between wetland ecosystem services through stakeholder analysis 2. Improve development decisions through holistic analysis of trade-offs between ecosystem services under alternative management interventions-this can be supported by science e.g. trade-off modeling

Major Element	Strategies	Ways to implement
	ecosystem services and human welfare	<ol style="list-style-type: none"> 3. Develop management scenarios for trade-off analysis through participatory stakeholder workshops 4. Communicate the guidelines on sustainable management of wetlands based on the findings of the trade-off analysis to all stakeholders
Optimal harvest of wetland resources	Establish inventory of stocks of wetland resource and sustainable yield of wetlands	<ol style="list-style-type: none"> 1. Conduct detailed assessments of the stocks and states of natural resources provided by wetlands 2. Carry out comprehensive assessments to determine the optimal take-off of different wetland resources 3. Carry out assessments to determine the sustainable yields of wetland resources in isolated sense and in the sense of maintaining optimal balance of resources and ecosystem functions to maximize economic value 4. Implementing monitoring programmes to ensure that resource harvesting does not exceed sustainable yield
Addressing the short-term livelihood requirements (food and income) of wetland communities	Put in place initiatives to improve incomes and food security concerns of wetland communities	<ol style="list-style-type: none"> 1. Identify possibilities of diversifying into alternative (non-wetland) livelihood activities e.g. alternative energy sources other than depending on wetland fuel wood resources; improve irrigation infrastructure, 2. Promote other high income wetland use opportunities e.g. ecotourism which can possibly result in higher income than current degrading uses of wetlands 3. Explore opportunities for wetland farmers to diversify into high value cash crops 4. Identify (with the communities in a participatory manner) income generating projects that communities can engage in with facilitation from the government and other private organizations 5. Improve smallholder farmer adaptation to risks associated with climate variability through crop diversification, promotion of drought tolerant crops and varieties
Ensuring equitable sharing of wetland ecosystem benefits between wetland dependent communities and beneficiaries external to the wetland	Promote stakeholder engagement and establishment of multi-stakeholder collaborations	<ol style="list-style-type: none"> 1. Implement stakeholder analysis to identify the different stakeholders involved in the management of the wetland 2. Identify tangible benefits to be gained through sustainable management of wetlands 3. Identify opportunities for synergies and collaborations among stakeholders

3.8 Cornerstone 8: Facilitation of land users or communities which ensures inclusive consensus based planning and management process

3.8.1 Relevance of the cornerstone

Sustainable wetland management is possible through the implementation of community developed wetland management plans that result from a facilitated participatory land use planning (participatory wetland management planning) process, i.e. development of community wetland management plans with the full involvement of community members. Participatory land use planning (participatory wetland management planning) is a dialogue between all involved stakeholders in the community (DSE, 1996; EMA, 2007). It is a process that brings diverse groups of people, and individuals with

different interests, values and perspectives together for a shared vision. It is done by the community for the community and therefore provides an opportunity to formulate highly sustainable wetland use systems for development. Proper facilitation is the key to this process (of participatory wetland planning).

Facilitation is required for:

- Definition of negotiated boundaries
- Community to take stock of their natural resources and productive land resources base
- Assessment of the area's production and land resource issues
- Prioritization of natural resources and land issues as perceived by the community
- Setting out of strategies and targets to address the problem and to use natural resources efficiently
- Communities developing their own implementation plans that can achieve real land use improvements and results that address the needs of the community.

Due to the non-homogeneity of communities, it is important to facilitate the identification of different stakeholder groups' needs. A detailed stakeholder analysis is required. Facilitation also ensures that through the stakeholder analysis and engagement process

- Community priorities are taken into consideration and negotiated prioritization takes place. Endogenous wetland use plans are developed that are flexible and once empowered, the communities can refine their plans in response to changed needs and circumstance.
- Communities are fully responsible for the implementation and monitoring the impacts of the plans.
- Communities can update, alter or change their plan appropriately as the need arises.
- Communities take ownership of their wetland and that is the basis of sustainable wetland management.

3.8.2 What do we want to achieve?

With the facilitation of land user or communities which ensures inclusive consensus-based planning and management process, we are aiming at a process that involves all relevant sectors and groupings of the local community in coming together resulting in the:-

- Involvement of the community in stocktaking of their land resources to address land use potential, strengths, opportunities and suitability for various uses with short, medium or long term strategies, and to define their development;
- Facilitation of the community to identify their problems, concerns, needs and a framework to work together to solve their problem;
- Provision of processes that allows communities effective debate, negotiate, communicate and awareness building;
- Identification of alternatives, options and choices for sustainable management of wetland resources e.g. fishing – fisheries, wildlife, rangeland products, grazing, water resources utilization, farming etc;
- Focusing on local administration, institutions, agencies and affected parties to manage and coordinate their land use systems in an effective and efficient way;
- Examination and the addressing of the key issues minimizing the impact of threats and weaknesses e.g. erosion, droughts, water shortages, floods, stress on the ecosystems.
- Focusing on local land use issues together with the socio-economic situation of the community and its groups;
- Development and agreement on a community vision;
- Active community participation offering ideas, concerns, opinion, priorities, perception, inclinations, aspirations and solutions to their problems and development initiatives;
- Preparation of land use plans that take account of economic, social and cultural aspects; and

- Presentation of implementation mechanism wholly owned by communities, indicating: action that will be taken; their desired outcomes or results; monitoring performance and achievements to be measured and evaluation by whom, how, when etc.

3.8.3 The possible actors and their roles

Key actors are Government extension agents, Non Governmental Organizations, development workers and community leaders, who will facilitate different aspects of wetland management. Extension agents can facilitate the development and implementation of management plans. Community leaders can facilitate the implementation of management plans by ensuring that agreed actions take place and also through the enforcement of agreed by-laws and regulations. Other stakeholders like researchers will also facilitate community members to participate in technology development and monitoring of wetland processes. All support stakeholders working in wetlands should play a facilitator role with the community taking the lead.

3.8.4 What are the major issues and challenges?

The major challenge is facilitation competence for extension and development staff. Most researchers, extension and development workers lack the required skills and attitudes to facilitate sustainable wetland management. A good facilitator should be capable of managing group dynamics, including power imbalances that threaten the voice of less powerful actors. The facilitator should be conversant with techniques for team building and visualization; familiar with principles of adult learning; and be able to employ questioning techniques to encourage deeper reflection or encourage the group to sharpen their focus on the issue at hand. A good facilitator will have both technical knowledge of the issue being discussed (in this case wetland management) and an array of personal qualities that engender respect and enable them to manage group dynamics. The key personal qualities required include empathy, flexibility and creativity. Facilitators must also have an array of “soft skills”, including good listening skills to enable follow-up on all contributions, ability to respect and impartially consider unorthodox views, the ability to perceive and manage latent conflict, tools and methods for facilitating different kinds of situations, and the analytical capacity to integrate and synthesize diverse views to distill an emerging consensus or key points of difference. Box 3.12 summarizes the various competences that a good facilitator should have.

Box 3.12 Competencies required in the facilitation process

Facilitation Skills

- Knowledge of group dynamics
- Team building techniques
- Principle of adult education
- Questioning techniques
- Visualisation techniques

Technical & Methodological skills

- Principles of technologies for sustainable wetland management
- Rural livelihoods systems
- Extension approaches and methods

Management skills

- Planning and action planning
- Effective reporting
- Project proposal writing etc.

Emotional Intelligence

- Empathy
- Authenticity
- Flexibility
- Creativity
- Team skills etc.

Availability of facilitation and planning tools and methods is also a major challenge. First, in the three countries studied there is shortage of skills among the trained extension personnel who work with wetland users to manage wetlands. Secondly, even for those that have the skills and the necessary training, there are not always tools available to them to demonstrate key concepts (for example soil erosion processes) to wetland users or communities. The tools should be participatory and use local materials and not necessarily computer based models (e.g. see Box 3.13).

3.8.5 Promising strategies

Table 3.11 shows some of the important promising strategies that can be used to address the identified facilitation challenges.

Table: 3.11 Promising strategies that can be used to address identified facilitation challenges.

Major Element	Strategies	Ways to implement
Facilitation role and capacity	Develop facilitation capacity in Government and Non-Governmental support institutions, and community leaders	<ul style="list-style-type: none"> ▪ Create awareness on the importance of facilitation skills in development workers and community leaders. ▪ Include facilitation training in institutions of higher learning. ▪ Include facilitation competence as prerequisite skill for all development workers. ▪ Organize facilitation in- service training course for development workers, ▪ Provide facilitation training for community leaders.

Major Element	Strategies	Ways to implement
		<ul style="list-style-type: none"> ▪ Provide facilitation coaching and mentoring. ▪ Establish facilitation competence development “institutions of excellence”
Facilitation tools and methods	Facilitation tool box development Facilitation guidelines development	<ul style="list-style-type: none"> ▪ Inventory and description of facilitation tools available. ▪ Development of learning materials, such as manuals and video. ▪ Development and documentation of cases of effective use of facilitation tools in wetland management.
Planning tools and methods	Planning tools box development Participatory planning guidelines development	<ul style="list-style-type: none"> ▪ Inventory and description of participatory planning tools available ▪ Development and dissemination of participatory planning learning materials such as manuals and videos. ▪ Development and documentation of cases of effective use of participatory planning tools in wetland management.

The important role of facilitation particularly in creating awareness and enhancing community members’ understanding of the complex wetland hydrological processes was demonstrated at all the project sites through the use of simple tools to facilitate discussions (Box 3.13).

Box 3.13 Example – facilitation of the discussion of wetland Soil and Water management principles at Chibuto wetland, Mozambique - ‘the three fields’

To initiate discussion on soil and water management principles, three field demonstrations were used as facilitation tool. This method involves the use of a sprinkling can as a rainfall simulator and boxes of soil as fields to simulate the processes of water infiltration and erosion and to encourage group exploration, discovery and learning as a basis for field monitoring. With the help of these tools the farmers could identify the causes and effects of erosion thereby help the understanding the key hydrological processes in a wetland. Three model fields were constructed by filling the boxes with soil. One field was mulched, one had tied ridges and the third was an ordinary untreated ploughed field. Each model field had a chute at the top, and an outlet at the bottom. Under each chute and outlet there was a measuring cylinder to measure the runoff and seepage from the fields. Slope inclination was adjusted by changing the orientation of bricks underlying the boxes. Loss of water through runoff and soil through erosion from the three model fields were compared during a rainstorm induced by a watering can. Runoff, groundwater outflow and soil were collected in the cylinders. The mulched and ridged models retained water and soil while high runoff and soil loss occurred in the untreated field. There was limited retention of water and soil on the untreated model field compared to the ridged and mulched model plots.



Field demonstrations for facilitating the discussion of wetland management principles



Field demonstrations for facilitating the discussion of wetland management principles

Questions used to engage wetland users in the discussion included:

What happened? Why did it happen? Have you observed this happened in your fields? What is the effect in your field and how has this changed your field? What effects can this have on crops growing in such a field?

Some observations by farmers at Chibuto and Intunjambili are:

- Soil cover is important to reduce surface runoff and hence increase infiltration.
- On an unprotected field, a lot runoff occurs and wetland dry-off.
- Surface runoff carries with it top soil, soil organic matter which will be deposited in the river affecting fish and livestock watering.
- Drying up of wells/wetland would also result in drying up of springs for domestic water use.
- An eroded (shallow) soil has very poor water holding capacity.
- On a shallow soil, the crop experiences a drought in a wetland

4. Limitations of the guidelines

The guideline was formulated using information collated from components of a multidisciplinary study carried out at three sites in different hydroclimatological parts of the Limpopo basin. It drew from three study sites, and from interventions practiced by households farming wetlands in these study sites. However, the framework is generic, and can be applied to other natural resources management issues. However, the specific technical interventions highlighted in the document are likely to be specific to the biophysical zones from which they are drawn within the Limpopo basin.

5. Summary

This guide presents a generic approach to key issues to consider in the pursuit of sustainable wetlands management. It outlines strategies that can be used to address challenges associated with wetland management. It is limited to issues relating to

The primary target group for this guide is officials working with rural communities to in managing wetlands and agricultural production using wetland water resources. This includes, but is not limited to agricultural extension officers, environmental and natural resources management officers, NGOs, and researchers. This guide provides these individuals with a road map showing issues, which, if not considered, can cause problems associated with poor management of wetland resources.

Some lessons from the cases studies from which this guide was drawn are:

- The challenges faced by wetland users are many; a multi-faceted approach incorporating both social and technical issues is considered more appropriate.
- Water management interventions are implemented in wetlands in order that certain desirable crops can be grown. These include drainage for crops like maize, irrigation in drier areas of the wetlands, and the use of residual moisture. These interventions result in different outcomes that are desirable at different times of the year.
- Land and water management in wetlands takes place at local level. Different rules as well as sanctions and penalties are applied enforced at this level. The local level appears to be the most logical entry point for effective and sustainable management of wetlands.
- With the current water management practices in the wetlands there is a potential for altering the structure or function of the wetland. For example, the “excess” of water during the rainy season was identified as one of the major constraint leading most of the time to land abandonment and therefore, limiting crop production. This excess water is drained, reducing residence time of water in the wetlands. Also the flow attenuation capacity of the wetlands is lost due to the drainage interventions.
- Maintenance of a shallow water table in the wetland aquifer is essential for crop production. Water management interventions for agriculture should focus on managing the water table and water distribution across the landscape.
- Farmers try to create conditions suitable for different crops rather than find crops suitable for the wetland condition.
- Policy and legislative environment and the penalties for cultivating in wetlands are not sufficiently deterrent. This results in continued wetland use for prohibited uses. Land disturbances, including water abstraction from the wetlands as well as drainage were evident in both South Africa and Zimbabwe. The agricultural extension service cannot support such use through providing technical advice as the use is illegal.
- There exist opportunities and incentives that can be used as entry points for better and sustainable management of wetlands. These include identifying, together with communities, ways of broadening people’s livelihood options. Some apparent opportunities can be seen in promotion of high income wetland use like ecotourism, identifying new markets for off-farm

income such as brick-making that takes place around the wetlands, and as well as integrating wetland management into broader rural development programs that are aimed at access to high yielding varieties, improving access to markets, and better extension services.

- There has been concerted effort on knowledge generation, identification of technologies, and building capacity of local communities. Similar effort needs to go into capacity building for those that engage with local communities to effectively deliver programs to these communities. Capacity building content for this target group should cover facilitation, technical, and management skills.
- Understanding ecosystem services provided by the wetland, to whom they accrue and their value (a lot of this information is derived from the ecological and socio-economic surveys). Scientists can identify the ecosystem services and quantify extent and temporal and spatial distribution as well as identify the beneficiaries (who/where & temporal variations). The communities need to understand the information generated by scientists and how it helps them to manage the resources and maintain the goods and services provided. Community based monitoring of change in the wetland promises to be one of the best approaches for communities to understand the change in functioning of the wetland.

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Glossary of terms

Common pool resources

Ecological character is “the sum of the biological, physical and chemical components of the wetland ecosystem, and their interactions, which maintain the wetland and its products, functions and attributes” (Ramsar COP7, 1999).

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood control, cultural services and supporting services. The concept of “ecosystem goods and services” is synonymous with ecosystem services

Ecological integrity is a condition of ecological safety that ensures access to a sustainable flow of ecosystem services needed by local communities to meet their basic capabilities

Facilitation involves applying a set of processes and “soft skills” to help individual or groups to attain their objectives. Facilitation means to make people think deeply and engage them in change.

Institutions are social arrangements that shape and regulate human behavior, have some degree of permanency and purpose, and transcend individual human lives and intentions and are often referred to as rules of the game in society.

Legal pluralism refers to the existence of more than one law side by side and may or may not interact within any development activity.

Organization refers to formalized institutionalized arrangements that have a structure and have defined roles.

Project law refers to conditions placed on human behavior on the basis of the philosophies and beliefs of interventions efforts e.g. research projects or development project.

Wise use of wetlands is the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development.