Wetlands and people

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Wetlands and people

Contents

What are wetlands?

There are many different types of wetland. These include areas of marsh, fen, peatland and shallow water bodies. Most are natural but some are human-made, and they can be permanent or seasonal. The water in wetlands can be flowing or static, and can be fresh, brackish or saline. Marine water that does not exceed 6 meters depth at low tide is also classed as a wetland, and many river estuaries are globally significant wetlands.

Despite this definition, modified from the Ramsar Convention on Wetlands (1971), there are different interpretations of what constitutes a wetland around the world. Measurement and mapping techniques also vary between countries and regions. This makes it difficult to accurately measure the number and extent of wetlands globally. According to two estimates,[1] wetlands cover between 125 and 131 million hectares (Mha) in Africa and between 204 and 286 Mha in Asia. Overall, scientists estimate that wetlands cover at least 6% of the world's land area.[2] In South America, the best estimate is approximately 179 Mha.

Wetlands play a vital role in the hydrological cycle. They are natural harvesters of rainwater, acting as sinks into which surface water and/or groundwater flows from the surrounding catchment.[3] Wetlands store this water for varying amounts of time. Some replenish groundwater and some regulate river flows. Some also clean water, removing pollutants and sediment. However, not all wetlands perform all these environmental services. The exact role they play depends on a wide range of site-specific features, including the type and location of the wetland.

Wetlands should be studied as part of wider hydrological systems and basins. The water in a wetland is influenced by activities upstream, and the use of water in a wetland has an impact on the water quality and quantity downstream. For example, high rates of extraction for agricultural use will affect the amount of water flowing out of a wetland, not just the amount in the wetland itself. It is essential to consider these flows when determining management options for wetlands.

Mekoro polers in Botswana. © Karin Duthie, Africa Media Online

1 Higher figures from Lehner and Döll 2004; lower figures from Finlayson et al.1999
2 Finlayson and D'Cruz 2005
3 McCartney et al. 2010

Wetlands and society

Wetlands typically offer a wide variety of benefits to society and they have played a central role in human development throughout history. Many great civilizations depended on them, including the Maya, Inca and Aztec in Latin America, the Khmer in Asia, the Marsh Arabs in Mesopotamia and those of the Nile and Niger in Africa.

Today, some of the world's largest wetlands are well known. The Okavango Delta in Botswana and the Pantanal in Brazil are famous for wildlife tourism; the Nile Delta in Egypt, the Ganges Delta in India and Bangladesh, and the Mekong Delta in Vietnam, although all heavily modified, support globally significant agriculture as well as other human activities.

But smaller, less well-known wetlands are also enormously important, acting as a source of food and water for people living nearby. For example, the Ga-Mampa wetland in South Africa is only 0.43 km^2, but is a vital resource for the surrounding communities (see 'Evaluating wetland management options in Ga-Mampa', page 24).[4] Cumulatively these small wetlands play a significant role in reducing poverty and supporting both livelihoods and biodiversity.

Grazing livestock in a wetland in Ethiopia. © Matthew McCartney, IWMI

The Ramsar Convention on Wetlands

The destruction of wetlands has led to several initiatives to protect and restore them. The most significant of these is the Ramsar Convention on Wetlands. Established in 1971 in Iran, the Ramsar Convention on Wetlands initially aimed to conserve wetland ecosystems, in particular for their importance as a habitat for birds.

Since then, the Ramsar Convention on Wetlands has shifted focus; it now seeks to protect wetlands not only for their value to wildlife, but also for the benefits they provide for humans, particularly people living in poverty. This is a key aspect of the principle of 'wise use' that the Ramsar Convention on Wetlands advocates.

Signatories to the Ramsar Convention on Wetlands are obliged to designate at least one wetland in their country as protected – this is added to the Ramsar List of Wetlands of International Importance. In addition, they are obliged to promote the wise use of all the wetlands in their territory, including those that have not been designated as Ramsar sites. The most recent signatory was South Sudan in 2013.

Source: www.ramsar.org

4 Morardet et al. 2013

Why are wetlands important?

For centuries, people in Europe saw wetlands as unproductive land: difficult to access, difficult to farm, and the source of disease and flooding. But attitudes have changed; wetlands are now widely recognized as valuable due to the diverse services they provide, especially to poor people, and the biodiversity that they support.

To a large extent, the services that a wetland provides stem from its biodiversity and its 'ecological character' – the structure and inter-relationships between its biological, chemical and physical components.[5] These can be classified into four broad groups: provisioning services, regulating services, cultural services and supporting services.[6] Table 1 presents some examples.

The different types of services can be closely linked. For example, provisioning services may be linked to cultural services where people attribute spiritual value to the products that they obtain from wetlands.

Table 1. Wetland services

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; supply of drinking water
▪ Fibers and fuel	▪ Production of logs, fuelwood, peat and fodder
▪ Biochemicals	▪ Extraction of medicines and other materials from flora and fauna
▪ Genetic material	▪ Genes for resistance to plant pathogens, ornamental species, etc.
Regulating	
▪ Climate regulation	▪ Source and sink for greenhouse gases, including carbon; influence on local and regional temperature, precipitation and other climate 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 and storm protection
▪ Pollination	▪ Habitat for pollinators
Cultural	
▪ Spiritual and inspirational ecosystems	▪ Source of inspiration; many religions attach spiritual and religious values to aspects of wetland
▪ Recreational	▪ Opportunities for recreational activities, such as wildlife tourism
▪ 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
▪ Biodiversity	▪ Wetlands are highly productive and provide a wide range of ecological niches, supporting extensive biodiversity

Adapted from: Wood et al. 2013a; McCartney et al. 2010; Millennium Ecosystem Assessment 2005

5 Ramsar Convention on Wetlands 1996
6 Wood et al. 2013a; Ramsar Convention on Wetlands/FAO/IWMI 2013; Atapattu et al. 2010; McCartney et al. 2010

Provisioning services are perhaps the most significant in terms of sustaining fundamental human needs, reducing poverty and supporting people's livelihoods.[7] Even the smallest wetland can be a vital resource for people living nearby, providing water for themselves, their crops and livestock, or a source of food and fish. These can be life-saving 'safety nets' in arid and semi-arid regions, often being the only source of water and food in the dry season.

However, while wetlands support livelihoods, they do not exist to 'serve' people. And as well as the benefits they offer, there are also dis-services. For example, malaria may be enhanced in and around wetlands, particularly those that are degraded. However, it is widely argued that these risks are lower in healthy wetlands that provide a habitat not only for mosquitoes, but also their predators.[8]

Assessing the economic value of wetlands is complicated. Many of the services they provide, such as storing carbon, are a 'public good' and difficult to measure in financial terms. A crude estimate of the global value of wetlands is US$70 billion a year.[9]

There is stronger evidence of the role that wetlands play in some developing country economies. In Zambia, for example, wetlands are estimated to contribute around 5% of gross domestic product (GDP).[10] They often support the poorest people in a region, so their economic benefits are often more significant than a simple measure of their contribution to GDP might imply. For example, in Tanzania's Kilombero Valley, wetlands contribute up to 80% of cash income for the poorest households.[11] Wetlands also help to address the root causes of poverty, such as poor nutrition and a lack of clean water.

Three female workers take a lunch break on a salt farm on Sambhar Salt Lake, India. © iStock.com/Iryna_Rasko

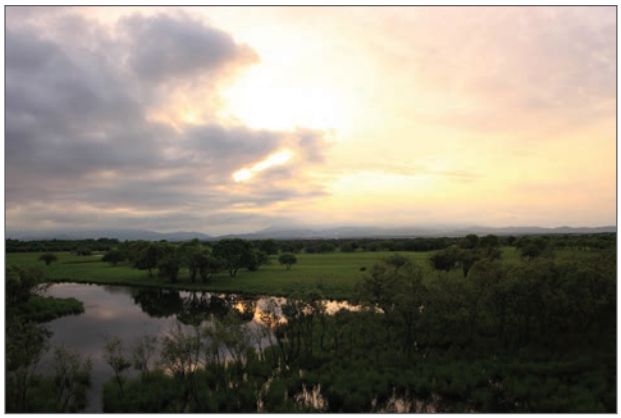
7 Millennium Ecosystem Assessment 2005
8 Chase and Knight 2003
9 Schuyt and Brander 2004
10 Wood et al. 2013a
11 McCartney et al. 2010

Threats to wetlands

Wetlands are dynamic ecosystems, changing naturally over time as a consequence of processes such as erosion, sedimentation and coastal flooding. However, human activities, either within the wetland or in the catchment in which they are situated, can alter these natural processes and accelerate the rate of change, threatening the wetland's continued existence.

While threats vary between regions and even within wetlands, agriculture is considered to be the most significant. This is partly due to the scale of wetland agriculture, which has increased dramatically in recent years and damaged wetlands across the world. But it is also due to its nature: many wetlands have been extensively and irreversibly modified as humans try to increase agricultural productivity.

One of the main impacts is disruption to wetland hydrology. Many have been drained so that the land can be used to grow crops, including biofuels – 12 Mha of peatland have been drained in Southeast Asia for palm oil production.[12] Other impacts include diverting water via irrigation canals and the over-extraction of water for intensive agriculture. Fertilizers, pesticides and other agrochemicals can pollute the water in a wetland.[13]



Sanjiang Plains, China. © Sanjiv de Silva, IWMI

While the farmers within a wetland are often the focus of attention for those seeking to protect wetlands, agricultural practices upstream also affect the quality and quantity of water flowing into them. For example, upstream irrigation projects and extraction for agriculture can reduce the flow of water to a wetland. Agricultural practices may also increase surface runoff and soil erosion, thereby increasing the amount of sediment entering a wetland. Wetlands should be considered as part of larger landscapes (e.g. a basin) when examining agriculture–wetland interactions.

These threats are likely to grow in the next few decades, as populations rise and demand more food and greater economic development.[14] Nor is this threat confined to developing countries; many developed countries face similar problems. For example, the abstraction of groundwater in Spain's Guadiana basin has led to rivers and wetlands drying up.[15]

Although some countries have policies for wetland management, they are often influenced by the policies of several different sectors. Agricultural policies in particular have been a key driver of changes to wetlands. In China, for example, government policies to drive economic growth and increase food security after the Communist Revolution (1946–1950) led to an increase in agricultural production, as millions of people moved to work on the land. In the Sanjiang wetland in Heilongjiang Province, this resulted in the area of wetland declining from 5.36 Mha to 1.04 by 2000.[16]

12 McCartney et al. 2010
13 McCartney et al. 2005
14 Molden 2007
15 Ramsar Convention on Wetlands/FAO/IWMI 2013
16 McCartney et al. 2010

Agriculture is not the only activity that damages wetlands. Populations around wetlands often grow quickly, leading to pressure on natural resources. With global populations predicted to continue rising, human demands on wetlands are likely to increase further. Large water infrastructure projects, such as dams, often pose a significant threat to wetlands because of their effects on hydrology (see 'The impacts of dams in the Nile Basin', below). Other upstream interventions, urban development and water extraction for industry can also have extreme impacts on wetlands located downstream.

Climate change is also expected to escalate the pressure on wetlands. More variable rainfall could affect the natural replenishment of many wetlands, and coastal areas are already at risk of flooding from sea-level rise; it is estimated that 22% of coastal wetlands could be lost by 2080.[17] Mining is another threat in some regions.

The impacts of dams in the Nile Basin

Wetlands cover approximately 10% of the Nile Basin and support the livelihoods of millions of people. But these have been greatly affected by human activities, particularly the construction of dams. While dams offer benefits such as hydropower, and indeed create new artificial wetlands, they also have severe negative impacts.

In Egypt, the Aswan High Dam has increased the amount of agricultural land and water availability (lengthening the agricultural year), and generates electricity through hydropower.[18] But it has affected the quality and quantity of water flowing downstream. For example, the dam limits the amount of water and nutrient-rich sediment reaching the Nile Delta, disrupting the natural fertilization of this wetland.[19]

Further large infrastructure projects are being considered in the Nile Basin, such as the completion of the Jonglei Canal, which will divert water around the Sudd wetland. These need careful planning, with policy-makers considering the impacts on water flows and wetland users downstream.

Source: Rebelo and McCartney 2012

Aswan Dam, Egypt. © iStock.com/efrem

17 Nicholls et al. 1999
18 Biswas 1992
19 Hamza 2009

Wetland agriculture

Many types of wetland are highly suitable for agriculture, and have been used for agriculture for thousands of years, especially riverine wetlands in floodplains.[20] They provide a ready supply of water, are usually found in flat areas, and the regular input of sediment and plant material means that many are naturally fertile.

In southern Africa, for example, many forms of traditional smallholder agriculture in wetlands are modified each year, depending on the changing moisture conditions. When European farmers arrived in southern Africa (from the 1600s onwards), they were attracted to the wetlands, which were easy to plough and remained moist, even in the dry winter months.[21] However, European farming systems tended to be larger in scale and less adaptable, requiring similar soil moisture throughout the area of the wetlands. As a result they introduced drainage and inadvertently caused erosion.

Recession agriculture in the Bahi wetland, Tanzania.
© Lisa-Maria Rebelo, IWMI

Wetlands are playing an increasingly significant role in the agricultural output of many developing countries; 48% and 66% of Ramsar-designated wetlands in Asia and Africa respectively are used for agriculture.[22] Some argue that in Africa wetlands represent a new – possibly the last – 'agricultural frontier'.[23]

Many different types of agriculture take place in wetlands:

- Wetlands can be used for growing staple subsistence crops, as well as more lucrative crops, such as vegetables.
- Many pastoralists and livestock keepers depend on them as a source of water for their animals; reeds and other plants are a source of fodder. Wetlands are contributing to the development of the dairy industry in Uganda.[24]
- They provide a reliable supply of water for irrigated crops, for example rice paddies; in arid and semi-arid areas, wetlands are often the only source of moisture.
- Many wetlands are used for fishing and some are also used for aquaculture.
- Some wetlands are actually created, and their ecological character is largely determined, by agricultural practices. For example, rice paddies are considered to be wetlands, as are fish ponds constructed to supplement incomes and diets.

20 Ramsar Convention on Wetlands/FAO/IWMI 2013
21 Whitlow 1990
22 McCartney et al. 2010
23 Dixon and Wood 2003
24 Nakangu and Bagyenda 2013

Improving livelihoods in the Inner Niger Delta

If managed carefully, agriculture can thrive in wetlands and be sustainable. Through a range of different activities, the Inner Niger Delta (also known as the Macina) in Mali plays a central role in improving the livelihoods of many of the people living within it.

- The richness of the floodplain soils enables farmers to grow rice, millet, maize and wheat.
- A small vegetable garden produces onions, tomatoes, eggplant and okra, improving nutrition in local households.[25]
- The delta supports around 2 million cattle and 3 million sheep, some of the highest livestock densities in Africa.
- Around 300,000 people earn a living from fishing in the delta, although yields vary from 40,000 to 80,000 tonnes a year.

Agriculture is under threat, however; upstream dams and irrigation schemes have affected the magnitude and timing of seasonal floods, which play a part in many of these systems. These have already reduced rice harvests by up to 15% and fishing by 18%.

Source: Zwarts et al. 2005

Livestock feeding at a wetland in Mali. © Sanjiv de Silva, IWMI

25 Wetlands International 2009

Calculating the agricultural potential of wetlands

Policy-makers and governments often consider agriculture to be the most productive potential use of a wetland – in turn making it the greatest threat – but this needs to be assessed based on its characteristics. The type and extent of agriculture depends on the size, type and biophysical characteristics of each wetland.

IWMI developed the concept of Working Wetland Potential[26] as a way to evaluate the potential value of individual wetlands, in terms of their economic value from agriculture and the environmental services they provide, which can be difficult to quantify. Using multi-criteria analysis, this approach attempts to simplify the many complex factors associated with balancing the multiple uses of a wetland: its ecological condition, its contribution to social welfare, and the development pressures on it. These are analyzed to establish where a wetland lies on the scale, from having no potential for being used for agriculture, to high potential. The results of the analysis can then be fed into planning and management decisions.

Although not tested widely by IWMI, Working Wetland Potential has been cited as a useful approach by the UNESCO-IHE Institute for Water Education. It has also been proposed for inclusion in a study to provide science-based guidelines, tools and policy advice for the sustainable use of wetlands in East Africa. It remains a potentially useful tool for establishing the value of wetlands, in terms of economic benefits for local people and the wider environmental services provided.

Escaping poverty through wetland agriculture

Cecilia Pensulo, from Mpika District in Northern Zambia, struggled to support herself and her four children on her irregular income from farm laboring. To increase her income, she decided to start farming herself in the dambo – a type of seasonal wetland – near her village.

With help from a local non-governmental organization, Cecilia learned new farming methods to make this previously unused land productive. In her first year, she only developed a small area, but the crops were good and the prices she got were high. In her second year, she cultivated 0.25 hectares, growing pumpkins, squashes and tomatoes. She sold the crop to traders and managed to make the equivalent of over US$200 – a small fortune by local standards.

Cecilia invested some of her profits in chicken rearing. The chickens are sold every 3 to 4 months, earning a profit of approximately US$300 each time. Her wetland farming is still ongoing, but is less intensive now that she has diversified. However, she says that she will never give up dambo cultivation as it provides her family with food during times of scarcity.

Through these varied activities, Cecilia is able to meet all her household costs and has enough income to send her children to school. She is now a respected member of her community and was elected as the secretary for the community school. Dambo cultivation not only fed her family, but helped her have a voice in her community.

Source: Sampa 2008

26 McCartney et al. 2005; McCartney et al. 2010

Competing demands for wetland agriculture

While the potential for agriculture varies between wetlands, it also varies between different sectors of a community. In some places, wetland agriculture only benefits a small number of people, while the very poorest people feel the negative consequences most heavily.[27]

Poor people can also lose out to large-scale agricultural interests; if agriculture in a wetland is intensified, it can demand a greater amount of water or land. Those depending on the wetland for small-scale or subsistence agriculture or other uses can easily lose out. Not only must agricultural potential be balanced against ecosystem services and biodiversity conservation, but also the competing demands for different types of agriculture must be factored in.

For example, the Kalametiya coastal lagoon in Sri Lanka is used for rice production and fishing. But changes to the lagoon have increased competition between rice paddy farmers and fishermen. Bunds (barriers) built to prevent the paddy fields flooding, along with an outlet built to channel irrigation water to the sea (rather than the wetland), have reduced the flow of water to the lagoon, leading to a decrease in its size. This has resulted in a drastic decline in the number of people able to earn a living from fishing. The fishers want to see the bunds destroyed and the outlet channel blocked, but this would then affect rice production.[28]

Multiple uses of the Lake Chilwa wetland

Lake Chilwa, the second-largest lake in Malawi, is surrounded by wetlands that cover 2,248 km^2. The wetland, which is a Ramsar site, is a mix of reed swamp, marsh and floodplain grassland. The lake supports around 1.5 million water birds, with about 160 different species present.[29]

The Lake Chilwa catchment has one of the highest population densities in the country, with approximately 162 persons per km^2 (the national average is 104 persons per km^2). It is an important source of livelihood for over a million people and supports a wide variety of activities, including fishing, agriculture and hunting water birds.

It is one of the most productive lakes in Africa in terms of fish, typically providing 20% of the country's total fish catch (and up to 43% in some years).[30] Fishing takes place year-round in the area of permanent open water. The floodplain is used for fishing during the wet season and for small-scale rice growing as flood levels recede. During the dry season, this area is predominantly used for grazing and growing vegetables.

Other parts of the wetland are also used to grow rice. In the 1970s several large-scale irrigation schemes were established in the wetland, to grow high-yielding rice varieties. These produce 50% of all the rice grown in Malawi.

Overall, the economic value of the wetland is estimated to be US$212 million per year.[31] However, as the lake has no outlet, water levels are greatly affected by seasonal rains and summer evaporation. There are concerns about the effects on food security if the lake dries up completely in the future: it dried up nine times in the 20th century due to low rainfall, and climate change is likely to increase the variability of rainfall in the catchment.[32] An integrated management plan needs to be developed to ensure the sustainability of its many uses in the future.

27 Woodhouse et al. 2000
28 McCartney et al. 2010
29 http://en.wikipedia.org/wiki/Lake_Chilwa
30 Jamu et al. 2006
31 Schuyt and Brander 2004
32 Environment News Service 2012; WorldFish n.d.

People-centered wetland management

Although wetlands have traditionally been protected for their value to wildlife and the environment, policy-makers and conservation groups are increasingly recognizing the role that these areas play in supporting rural livelihoods and reducing poverty. Millions of people directly depend on wetlands for their livelihood, and these are often the poorest groups in society. This figure includes: around 1.5 million in the Hadejia-Nguru wetland in Nigeria; more than 1 million in the Sudd wetland in South Sudan; 1 million people near Lake Chilwa in Malawi; and 300,000 in the Inner Niger Delta in Mali.[33]

Ensuring wetlands are used sustainably will ensure that poor people can continue to obtain the benefits that wetlands provide, and is therefore essential for reducing poverty. Because wetlands are sensitive ecosystems, indiscriminate exploitation is not sustainable. However, a 'people-centered approach' to wetland management – a balanced approach that seeks to optimize the benefits for poor people, including through appropriate wetland agriculture, while simultaneously protecting vital ecosystem services – is essential if wetlands are to be conserved for future generations.[34]

This people-centered approach complements the 'wise use' principle put forward by the Ramsar Convention on Wetlands in 1987. This argues for the conservation and sustainable use of wetlands and their resources, for the benefit of humankind.[35] This is a significant step – moving from wetland protection alone to integrating conservation and development (see 'Changing attitudes to conservation and development', page 16).

It should be noted, however, that managing wetlands to support people's livelihoods will not always be totally congruent with managing them for conservation objectives. There will often be conflicts and trade-offs between livelihood requirements and conservation; these require skillful and innovative forms of management (see 'Trade-offs', page 18).

Night shift fishermen, Mongu, Western Zambia. © Felix Clay, Duckrabbit

33 IWMI n.d.
34 Wood et al. 2013a
35 Ramsar Convention on Wetlands/FAO/IWMI 2013; Wood et al. 2013a

Rice-fish farming in Cambodia

Fish and other aquatic animals – frogs, crabs, snails and shrimps – are a key wetland resource for many poor people in Cambodia. Harvested from flooded rice paddy fields, these creatures have a higher nutritional value than rice and are an important source of animal protein. They can also supplement incomes if people catch enough to sell.

The Tonle Sap Great Lake area is the largest body of freshwater in Southeast Asia, with a high diversity of fish species. Nearly 3 million people live around the wetland and many earn their livelihood from it. Growing rice in the seasonally flooded wetland is the main activity, but fishing is a vital safety net against the rice harvest failing. The value of fish and other aquatic animals from rice fields in Battambang, near Tonle Sap, is around US$100 per hectare; this is almost as high as the value of rice from one wet season crop, US$150 per hectare.[36]

Balancing rice production and fisheries is not easy. While traditional rice cultivation in Cambodia has few inputs, efforts to increase rice production in Tonle Sap have seen a rise in the use of agrochemicals. This has had a negative impact on aquatic life in the wetland. Fish stocks are declining as a result of habitat loss and overfishing. There is also concern that large hydropower dams, which are planned for the region, will block migration routes for fish and modify stream flows.

The social distribution of these impacts is also an issue. Rice intensification tends to benefit individual large-scale farmers, while the fisheries are a shared resource, so of greater importance to the poorest members of wetland communities.

Cambodia is now trying to ensure that both fishing and rice cultivation can continue in its wetlands. In 2011, the country signed a law to control pesticide and chemical fertilizer use, although its implementation is still limited.[37] Other potential solutions include refuge ponds for brood fish in the dry season, and reservoir and pond aquaculture sustained by regular restocking.

Sources: de Silva et al. 2013; McCartney et al. 2010

Fishing in southern Lao PDR. © Matthew McCartney, IWMI

36 Hortle et al. 2008
37 de Silva et al. 2013

Limits to wetland use

Wetlands provide a range of resources, but there are limits to the extent to which they can be exploited sustainably. Successful income-generating activities may prove unsustainable if a wetland is too small to support the local population, or if too many people migrate towards a wetland to benefit from its potential.

Wetland degradation by humans and poverty can easily become cyclical: as wetlands are altered, the services they provide are lost, pushing people further into poverty, which in turn leads to further degradation. The Millennium Ecosystem Assessment (2005) predicted that if wetland loss and degradation continued, it would result in further reductions in human well-being, especially for poor people.

An example is the series of dams constructed on tributaries feeding the Hadejia-Nguru wetland in Nigeria since 1971. These reduced the volume and timing of water flowing into the wetland, leading to a decline in fish populations and reducing its agricultural potential and grazing areas, because of the reduced flood extent (the area that is seasonally flooded). These changes severely affected people's livelihoods and increased poverty; as a result, the population declined as people moved to nearby towns. The wetland also suffered further damage as people exploited its other resources to replace those they had lost.[38]

Natural processes can also limit the productivity of a wetland. The capacity of Negombo Lagoon, a naturally shallow coastal lagoon in Sri Lanka, is reducing as it fills with sediment washed downstream. The large number of people living nearby increases this sedimentation, as untreated sewage is dumped in the lagoon. These processes affect the lagoon's long-term productivity, in terms of the water and fish it can provide. The dense population also puts pressure on the wetland, as people seek to earn a living from it.[39]

Fishmongers prepare and sell the catch in Negombo, Sri Lanka. © iStock.com/Alan_Lagadu

38 McCartney et al. 2010
39 Senaratna Sellamuttu et al. 2011a

Generating income from wetlands

Biodiversity in a wetland can support poverty reduction and is often a safety net against people becoming poorer during particularly hard times.[40] But research shows that to reduce long-term poverty, it is necessary to create jobs and opportunities that move people beyond a subsistence livelihood.

Caohai Nature Reserve is a protected area in China's Guizhou Province. After a successful project to increase the involvement of local communities in managing the wetland, many local people are now involved in developing sustainable wetland activities.

A key aspect of the project's approach was a microcredit fund. Set up in 1993 by the International Crane Foundation and the Trickle Up Program, a poverty alleviation organization, the fund offered US$100 grants to help people develop new skills and access markets. They started over 550 small businesses, such as raising livestock, making stoves from old oil barrels, and offering boat rides for tourists to view the area's water birds. This reduced their dependency on destructive practices, helping to reduce wetland degradation. It also encouraged them to work with rangers in the protected area and help preserve the wetland.

Sources: International Crane Foundation n.d.; Senaratna Sellamuttu et al. 2011a

Caohai Nature Reserve. © International Crane Foundation

40 Senaratna Sellamuttu et al. 2011a

Changing attitudes to conservation and development

Attitudes towards protecting wetlands are changing among conservation organizations. Most have now moved away from a pure conservation focus to a perspective which recognizes that, to be sustainable, conservation must go hand-in-hand with development and acknowledge local people's rights to use and benefit from wetlands.

This shift is epitomized by the themes selected for recent Ramsar Convention Conferences of Parties. These include: 'People and wetlands: the vital link' (in 1999); 'Healthy wetlands, healthy people' (2008); and 'Wetlands: home and destination' (2012). In 2014, the theme of World Wetlands Day is 'Wetlands and agriculture: partners for growth'.

Many leading conservation organizations explicitly acknowledge the needs of people in their mandates. Wetlands International's mission is 'a world where wetlands are treasured and nurtured for their beauty, the life they support and the resources they provide'.[41] BirdLife International's mission includes commitments to 'sustain the vital ecological systems that underpin human livelihoods' and 'contribute to the alleviation of poverty'.[42] These are representative of the sector: the International Union for Conservation of Nature, WWF, the African Wildlife Foundation and many others all refer to people and sustainability in their vision statements.

This shift in thinking has come partly from experience. Many efforts to protect wetlands from any human activity failed because their importance to poor people means that protection measures were widely disregarded and impossible to enforce. There is also increasing awareness of the benefits that wetlands provide to local people; inclusive, rather than exclusive, conservation has become the narrative.

At the same time, there has been a similar shift in the thinking of development practitioners. There is now an increased recognition of the need to conserve the 'natural capital' that the environment provides, and on which many poor people depend: an understanding that sustainable development must be underpinned by the preservation of vital ecosystem services. Conservationists and development practitioners are converging in their thinking.

But while the different ideologies behind wetland management are coming together, there are still difficulties in practice. For example, even if only part of a wetland is protected, it will have an impact on the lives of the people who use that part and cannot relocate or use another part. And despite the move towards more sustainable use, wetlands are still being rapidly degraded and lost, especially where human populations are increasing and the demands for economic development are greatest.[43] Many governments in Africa currently give higher priority to food security than to biodiversity conservation.[44]

Failure to consider the links between poverty and conservation puts conservation interventions at risk.[45] In the long term, it can also exacerbate poverty. For example, many agricultural systems depend on the ecosystem services wetlands provide, and will ultimately fail if these are lost due to degradation. The key requirement for sustainable development is to find an appropriate balance between the different uses of a wetland and the variety of benefits it provides. It is essential to identify and make transparent the trade-offs between these.

Collecting firewood from Lake Chilwa, Malawi.
© Matthew McCartney, IWMI

41 Wetlands International 2013
42 BirdLife International 2013
43 Senaratna Sellamuttu et al. 2011a
44 Wood et al. 2013a
45 Adams et al. 2004

Differing perspectives on Ramsar designation in Zambia

People have used local knowledge systems to manage wetlands in Africa and Asia for centuries. But laws introduced to protect wetlands have overridden many of these systems – often against the wishes of local people.

The Lukanga wetland, part of Zambia's Kafue River catchment, is an important habitat for many songbirds and water birds. But as the local population increased, human activities including hunting and fishing threatened many species. Zambia has no single policy to guide the use and management of wetlands,[46] but is a signatory of the Ramsar Convention on Wetlands, and Lukanga was designated as a Ramsar site in 2005. This was done at the request of government departments, not the people using the wetland.

Different groups saw this designation in conflicting ways. The Zambian Government agreed to protect the wetland as part of its commitment to the international Convention on Biological Diversity. They also recognized the tourism potential of the area, arguing that this could be a source of income for poor local people.

However, members of the local Lenje people, and the Bemba people who migrated to the area to fish, saw the Ramsar designation as a threat to their livelihoods. They accused their traditional leaders of 'selling out' to the government by agreeing to limit traditional activities in favor of tourism development. They believed that tourism would only benefit external economic interests – at their expense. Restricted access to the wetlands also had cultural implications; local people believe that the wetlands host the spirits of their ancestors.

This case demonstrates that conservation without buy-in from local people will not work, despite the seemingly good intentions by national governments and international conventions such as the Ramsar Convention on Wetlands.

Sources: Mapedza et al. 2012; McCartney et al. 2011; Masiyandima et al. 2004

Lukanga wetland, Zambia. © Matthew McCartney, IWMI

46 Lusaka Voice 2013

Trade-offs

There is no blueprint for balancing conservation and development in all wetlands. Establishing the trade-offs between use and conservation depends on identifying the characteristics of the wetland, the ways in which it is used, and the values that people place on it. There are several challenges to establishing these parameters for trade-offs, however:

- Wetlands are complex ecosystems; it can be difficult to identify their specific environmental functions.
- Factors beyond the wetland can have a huge impact on how it functions (see 'Threats outside the wetland', below).
- Many services that wetlands provide are 'public goods', making it hard to determine an economic value for them.
- Some benefits are felt beyond the wetland itself, such as carbon sequestration, while the costs (i.e. potential lost opportunities) tend to be local.[47]

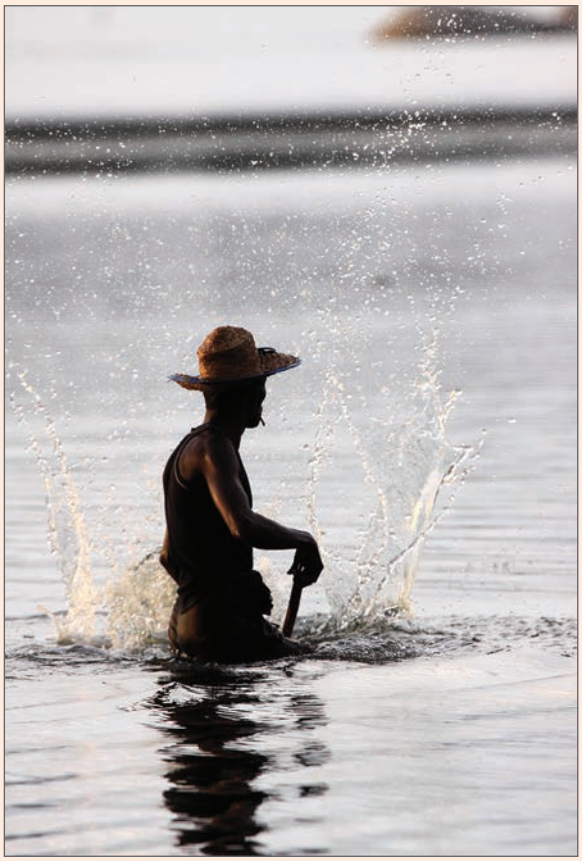
Threats outside the wetland

Decision-makers need to use an integrated water resources management approach when developing management strategies for wetlands. They must consider factors upstream and outside of the wetland. The potential of external factors to influence how wetlands function is demonstrated by two coastal lagoons that form a Ramsar site in south-east Sri Lanka: Bundala and Embilikala.

Coastal wetlands are the 'last stop on the line' in hydrological terms, being heavily influenced by upstream activities. The hydrology of Embilikala lagoon has been affected by agricultural practices upstream; water being extracted for agriculture, then released continually, has ended the natural cycle of flooding and drying in the lagoon, while runoff from agricultural land has increased the amount of sediment in the water.

This has affected the foraging habits of shoreline birds in the lagoon, notably their feeding efficiency. Many species require shallow water for feeding (1–10 cm in depth) but the hydrological changes mean that this specific habitat has become less prevalent in Embilikala lagoon, leading to declines in many bird populations. The nearby Bundala wetland has not been affected by agriculture in the same way, and the bird life there is thriving by comparison.

Sources: Bellio and Kingsford 2013



A fisherman in Bundala wetland, Sri Lanka.
© Sanjiv de Silva, IWMI

47 McCartney et al. 2005

Successful wetland management in Brazil

People's willingness to change how they use wetland resources will depend, in part, on whether they are involved in the process of determining their management.[48] If local people are fully included in these discussions, the results can be very successful.

Mamirauá is a seasonally flooded forest deep in Brazil's Amazon rainforest. The wetland is highly diverse biologically; it has over 400 fish species alone. These are an important source of protein for the people living in and around the reserve, who also use it for hunting and harvesting medicines and other resources. But the main threats to the reserve are logging and clearance for agriculture, particularly cattle ranching, from outside interests.

Brazil has the strictest environmental policies and legislation in South America, often with an emphasis on excluding people from protected reserves. But in Mamirauá, the local government worked closely with people living in the reserve, the Catholic Church and Sociedade Civil Mamirauá, a non-governmental organization, to develop a sustainable management plan.

The project, which began in 1992, aimed to establish a sustainable source of income for people living in and near the reserve, who face very high levels of poverty. A major success in 1996 was changing the protection status of the reserve from an Ecological Station – one of the strictest protected area categories in Brazil, which allows no human habitation or harvesting – to a Sustainable Development Reserve, which acknowledges local people's right to use a reserve.

The project then worked with local people to map where resources could be taken from the reserve, and how to restrict access to outsiders who were not permitted to use them. Local people decided which parts of the wetland could be used for fishing, for example, and how access should be rotated to allow stocks to recover. Local fisherman then received training in fisheries management to reduce the risk of overfishing. The project also strengthened laws preventing outsiders from exploiting the wetland.

Another successful initiative was the development of ecotourism, including a floating lodge for tourists (with numbers limited to reduce their impact). This provided an alternative source of income for some nearby communities, making them less dependent on the reserve's resources.

Involving local people throughout the project allowed them to have a stronger say in how the wetland was managed. They also became better organized, for example forming producers' associations. The result was a mutually agreed solution, representing a balance between wetland use that was locally acceptable and politically acceptable with regard to Brazil's environmental laws. While this may not be the 'best' option in terms of conservation or in terms of development, it has proved to be the 'best available' way to integrate these competing demands.

Sources: Senaratna Sellamuttu et al. 2011b; Koziell and Inoue 2006

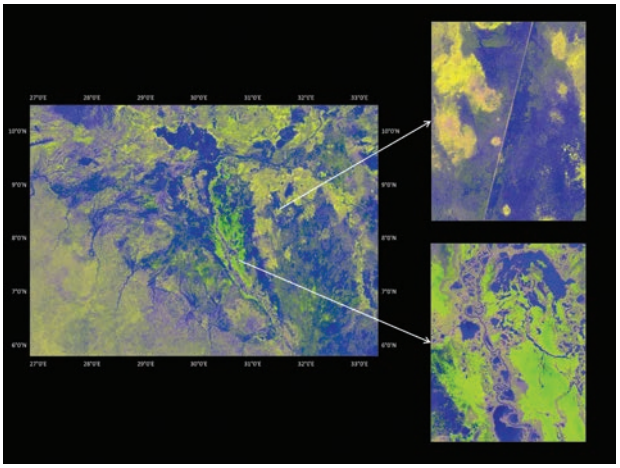
48 Senaratna Sellamuttu et al. 2011a

Mapping wetlands

One challenge for managing wetlands is the lack of spatial data describing them: where they are, how big they are, how their extent changes seasonally. IWMI is using remote sensing to improve the availability of data about wetlands.

This has been used to good effect in the Sudd wetland in South Sudan.[49] Until recently, few up-to-date data were available for this 5.7 Mha Ramsar site. There are long-standing plans to complete the Jonglei diversion canal to divert water around the wetland in order to increase downstream flows and reduce evaporative losses. Since the end of the civil war in Sudan, these have been revived.

IWMI is working with the Japan Aerospace Exploration Agency to provide information on the size of the wetland and how it varies seasonally. The satellite imagery enables researchers to identify water lying beneath vegetation, helping to build an accurate picture. These data can help with the development of management plans and, it is hoped, can ensure that the wetland retains enough water for the local communities who use the wetland, including the pastoralists who rely on its water for their livestock.



A satellite image of the Sudd wetland. © IWMI

Agriculture in the Nile Delta

The Nile Delta is a 22,000 km^2 wetland in northern Egypt, and has been used for agriculture for over 5000 years. But the construction of the two Aswan Dams upstream in the 20th century reduced natural flooding of the wetland and limited sediment flows. Since then, much more land has been converted to agriculture – the delta now produces around two thirds of Egypt's output.

Agriculture practices include crop production, fishing and hunting, and livestock rearing and pastoralism. But while this demonstrates the diversity of potential wetland agriculture, it also highlights how this can be a threat to wetlands. The lack of sediment has seen an increase in the use of fertilizers. And migration to the delta means that 63% of Egypt's people now live in its boundaries, despite it covering only 2.8% of Egypt's total area.

Source: Rebelo and McCartney 2012

49 Rebelo et al. 2012

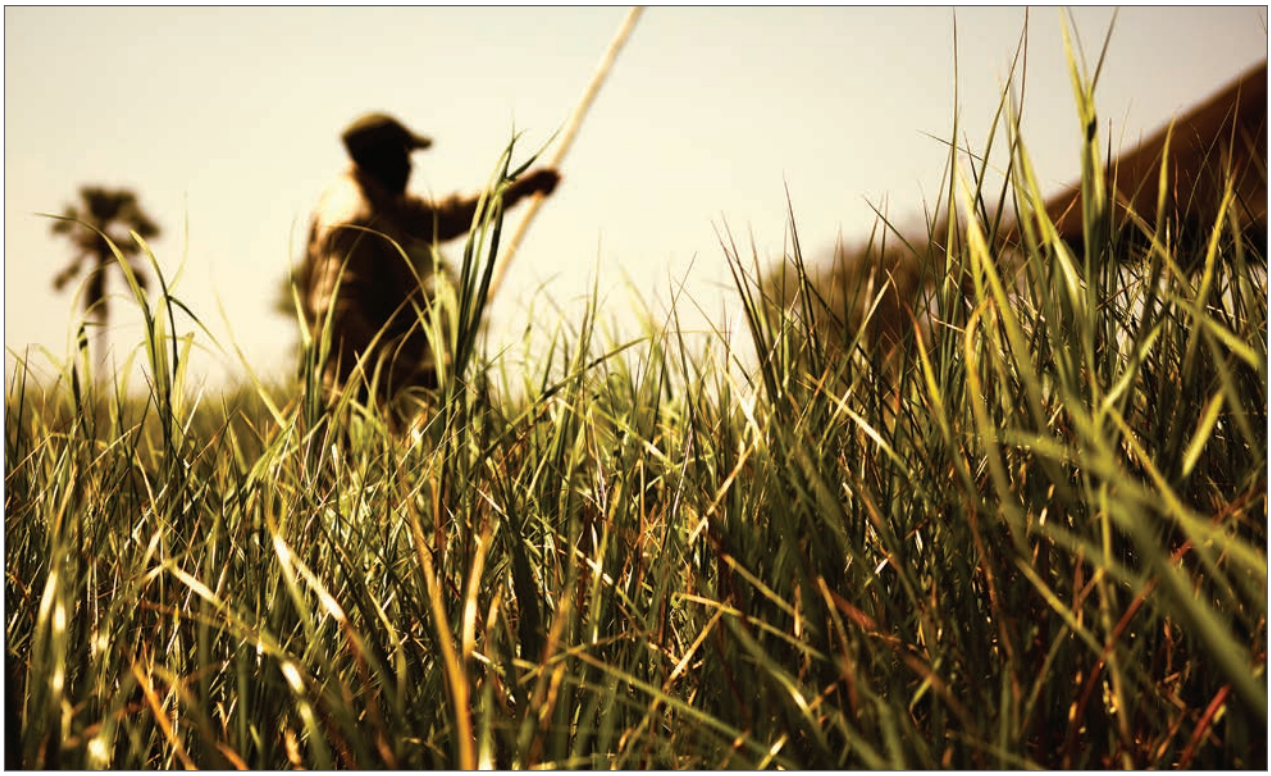
Integrating conservation and development

Involving local communities and wetland users in the process of establishing trade-offs is essential for success (see 'Successful wetland management in Brazil', page 19). Once these have been established, they should be developed into management plans that integrate the needs of local people with conservation goals.

But another factor for decision-makers to consider is the fact that wetlands evolve over time, through natural processes but also in terms of the pressures on them. People's expectations may increase as they move beyond subsistence living and aspire to greater affluence. This can increase the demands on a wetland, intensifying a resource use that was once sustainable. And a change to one wetland attribute is likely to cause changes in others.[50]

Management options therefore need to consider how to achieve a long-term balance between conservation and development. But many management approaches are time-bound, limited to a single project or until a certain objective is achieved. The wise use of wetlands should not be static; people will continue to use wetlands after a particular intervention has ended and this needs to be considered in planning processes.

The key is an integrated, adaptable approach: one that considers not just the current uses of a wetland, but how these are likely to change over time. Integrated approaches should also take external demands on a wetland into account, rather than focus on the wetland in isolation. Such an approach will be more adaptable over time and, as such, more likely to successfully preserve the wetland for use well into the future.



A Mokoro (canoe) poler powers through the reeds in the Okavango Delta, Botswana. © iStock.com/hadynyah

50 Senaratna Sellamuttu et al. 2011a

The political economy of wetlands

The relationship between people and wetlands must be central to wetland policies and management approaches.[51] But the governance of wetlands can be highly political. Each group – local users, conservation groups, businesses, regional and national governments – has its own views on how a wetland should be managed, and their own interests to promote. Too often, the values of local people go unrecognized in decision-making processes; large organizations and commercial interests have much more influence.

To complicate the issue further, there are often competing interests between different sectors of local communities – between better-off and poorer households, or between groups competing for the same resources. Few groups act with a truly holistic and objective vision of a wetland's values; they will all place different values on the services provided.

For example, a conservation organization may favor the development of ecotourism as a way to generate income with minimal impact on the ecosystem; local communities may want to increase fishing and agriculture in and around a wetland to supplement their income and food supplies; larger businesses may see the potential for generating income from more intensive agriculture; while local governments may be considering the land's economic value.

If governance systems can pull together these disparate interests, then a balance between a wetland's various functions and services can be maintained. But finding an appropriate and sustainable balance between these agendas is not easy, as demonstrated by the management of the Lukanga wetland (see 'Differing perspectives on Ramsar designation in Zambia', page 17). The example of Kolleru Lake in India (see 'Balancing needs in Kolleru Lake', opposite) highlights how a wetland can mean different things to different actors – farmers, aquaculturalists, locals and conservationists. It also shows how the ascendance of one group over the rest can distort the balance between exploitation and conservation, as well as the benefits accruing to the different actors.

Ultimately, people need to manage their own wetlands in sustainable ways. This requires them to be able to self-regulate the different uses of a wetland, and have incentives for sustainable management such as a demonstrable income or clear livelihood benefits. To be sustainable in the long term, these should come from market opportunities to sell wetland products rather than, for example, subsidies. Payments for environmental services, such as flood protection and carbon sequestration, may become viable incentives in some areas.[52]

Farmers near Ganvié lake village, Benin. © iStock.com/peeterv

51 Wood et al. 2013a
52 Wood et al. 2013b

Balancing needs in Kolleru Lake

Kolleru Lake in Andhra Pradesh, India, is one of the largest freshwater lakes in Asia. As well as being a vital habitat for birds (189 bird species have been recorded there), it has a long history of human use and conflict. Recent changes to the use of the lake demonstrate the challenges of establishing and maintaining the wise use of a wetland amid many competing demands.

During the 1990s, the Indian Government promoted intensive food production – mostly rice and aquaculture – in the lake, a shift from the previously dominant wetland agriculture. This was partly a response to food shortages in the region, but also to realize the wetland's economic potential through selling fish to other parts of India, such as Calcutta. But much of the aquaculture was taken over by outside business interests, meaning a large proportion of the income generated did not benefit local people.

The intensive aquaculture caused several problems in the lake's hydrological functioning. The aquaculture ponds set on the lake bed blocked the flow of rain water, which used to pass to the ocean. Kolleru Lake acts as a sink for storm water, and this blockage led to serious flooding in farms surrounding the wetland.

At the same time, conservation groups were lobbying for Kolleru Lake to be designated as a wildlife sanctuary to protect its resident and migratory bird populations. After a series of legal challenges, both in favor of the designation and objections by users of the lake, part of the lake was established as a sanctuary in 1999. The establishment of the protected area limited local communities' livelihood options to traditional fisheries and agriculture practices.

Despite this protection, aquaculture spread, driven by business interests and supported by the government. This caused continued degradation to the ecosystem and declining bird populations. In 2005, following further legal challenges from both sides, the aquaculture ponds were cleared from the protected area. This affected the livelihoods of local communities, many of whom were extremely poor. The destruction of the aquaculture ponds reduced the occurrence of flooding, but compensation for the demise of aquaculture was slow to arrive and limited in its extent. The government provided little support for new livelihoods, keeping people entrenched in poverty.

Kolleru Lake highlights the many challenges of putting the Ramsar Convention on Wetlands' concept of wise use into practice. When deciding the use of the lake, the Supreme Court of India failed to adequately consider the well-being of local communities living in the newly-created sanctuary. Lobbyists focused on the conservation aspects of the Ramsar Convention on Wetlands – which was used as an argument for creating the sanctuary – without acknowledging how this mandate has adapted to emphasize the importance of reducing poverty among wetland users. This highlights the need to identify and sensitize national and sub-national decision-makers on key Ramsar concepts such as wise use.

Source: Senaratna Sellamuttu et al. 2012

Local involvement in wetland management

There are no global solutions to wetland management; each varies in terms of its climate, ecosystem, pressures and users. Instead, wetlands need local-level policies and responses. How they are used and managed is ultimately determined by local stakeholders – by their needs and the values they place on different services. These stakeholders include local communities and users of the wetland, but also local authorities and people living upstream and downstream.

It is vital to involve local people in wetland planning, management and decision-making processes, and to give them clear rights to use wetlands.[53] Local people bring considerable knowledge of how a wetland functions and how to manage those functions – often developed over hundreds of years. In contrast to the view that local people are the chief cause of damage to wetlands, in reality they often protect and even rehabilitate them, regardless of whether there is a conservation initiative in place.[54]

The involvement of local people is also vital for building a consensus on how resources should be used and protected. Conservation initiatives without local acceptance will invariably fail, or be costly and confrontational to enforce; management options that local people have developed and agreed upon will, in many cases, survive over the longer term. However, it is also true that many traditional management systems are breaking down under the pressures of modern life, as people seek greater affluence and populations increase.

Evaluating wetland management options in Ga-Mampa

Including local people in developing management options is not always simple. While tools and frameworks exist to support the evaluation of wetlands and their services, applying these in practice can be problematic.

This is highlighted by experiences in Ga-Mampa, a small inland wetland in South Africa. For years it was used for activities including livestock rearing, hunting and collecting reeds and sedges. But after severe floods damaged other agriculture activities, much of the wetland was converted for growing crops. This decreased the size of the natural wetland from 0.96 km^2 to 0.43 km^2.[55]

Finding an acceptable way to protect the wetland while allowing local people to maintain their livelihoods was a challenge. Research by IWMI used a participatory approach to help local stakeholders evaluate the different possible management options. The most challenging part was to have stakeholders sit at the same table and understand other points of view and needs from the wetland. Groups involved included the community development forum (who nominally managed the wetland), the local Lepelle-Nkumpi Municipality, as well as provincial and national institutions.

The analysis ranked management solutions according to different criteria: environmental sustainability; economic development; social equity; cost effectiveness; and institutional clarity. Despite this complex analysis, no single compromise solution was identified.

But the process was successful in other ways. It initiated and strengthened dialogue between the different stakeholders, and provided an initial evaluation of the different options for decision-makers to consult. It also highlighted to all stakeholders that many of the problems came from outside the wetland, mainly due to cattle and goats ranging freely, and irrigation schemes decaying.

Source: Morardet et al. 2013

53 Wood et al. 2013a
54 Tiffen et al. 1994
55 Troy et al. 2007

Conclusion

The case studies in this report highlight the many ways in which wetlands support and improve the lives of poor people in Africa, Asia and Latin America. They are often the main source of food and water for the poorest people living nearby, or act as a safety net during hard times. In other places, wetland resources are providing a source of income to help people move permanently out of poverty.

But the many threats facing wetlands are not going away and in many places are intensifying. As populations increase and people need more food and water or aspire to having more money, the demands on wetlands escalate. Many have already been lost or irreparably damaged, and many more are under threat.

To ensure the future of wetlands and to sustain the many benefits they provide – to local communities and the wider population – we need to put people at the center of thinking about wetlands. Improving the livelihoods of poor people should be the central goal of policies and practice in developing countries.[56] And these people should be included in decision-making processes, so that their opinions, needs and knowledge help to form policies and management plans.

Conservation agendas still dominate wetland management in many countries.[57] To be sustainable these must be married to the needs of local people and other users. The best management approaches are those that allow for competing uses of the wetland's services to continue, but only to the extent that they do not degrade the wetland and lead to the services being lost.

Approaches will change as people's needs change. The best management approaches will therefore be inclusive, negotiated and flexible, empowering local people to manage wetlands in their own landscapes, to the benefit of both current and future generations.

A pirogue on the Inland Niger Delta, Djenne, Mali. © Ariadne Van Zandbergen, African Media Online

56 Wood et al. 2013b
57 Ibid.

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Additional resources

Ramsar Convention on Wetlands. www.ramsar.org

Wetland Action. www.wetlandaction.org

Wetlands International. www.wetlands.org

Wetlands are important ecosystems for people. They provide fresh water, food and a range of ecosystem services, as well as a source of income, contributing to the livelihoods and well-being of millions of the world's poorest and most vulnerable people.

But wetland management is challenging: decision-makers must balance the need to conserve wetlands – and the wide range of services they provide – with the changing needs of the people who use and depend on them. Using case studies and research from IWMI and other organizations, this booklet illustrates the benefits and services that wetlands provide in Africa, Asia and Latin America – poverty reduction, agriculture and livelihood activities, food and water – and argues for a more people-centered approach to wetland management.

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