THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY FOR WATER AND WETLANDS

Executive Summary

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The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

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KEY MESSAGES

1. The "nexus" between water, food and energy is one of the most fundamental relationships - and increasing challenges - for society.

2. Water security is a major and increasing concern in many parts of the world, including both the availability (including extreme events) and quality of water.

3. Global and local water cycle are strongly dependent on wetlands.

4. Without wetlands, the water cycle, carbon cycle and nutrient cycle would be significantly altered, mostly detrimentally. Yet policies and decisions do not sufficiently take into account these interconnections and interdependencies.

5. Wetlands are solutions to water security – they provide multiple ecosystem services supporting water security as well as offering many other benefits and values to society and the economy.

6. Values of both coastal and inland wetland ecosystem services are typically higher than for other ecosystem types.

7. Wetlands provide natural infrastructure that can help meet a range of policy objectives. Beyond water availability and quality, they are invaluable in supporting climate change mitigation and adaption, support health as well as livelihoods, local development and poverty eradication.

8. Maintaining and restoring wetlands in many cases also lead to cost savings when compared to man-made infrastructure solutions.

9. Despite their values and despite the potential policy synergies, wetlands have been, and continue to be, lost or degraded. This leads to biodiversity loss - as wetlands are some of the most biodiverse areas in the world, providing essential habitats for many species - and a loss of ecosystem services.

10. Wetland loss can lead to significant losses of human wellbeing, and have negative economic impacts on communities, countries and business, for example through exacerbating water security problems.

11. Wetlands and water-related ecosystem services need to become an integral part of water management in order to make the transition to a resource efficient, sustainable economy.

12. Action at all levels and by all stakeholders is needed if the opportunities and benefits of working with water and wetlands are to be fully realised and the consequences of continuing wetland loss appreciated and acted upon.


Photo credit: Lawrence Hislop

FOREWORD

The "nexus" between water, food and energy is one of the most fundamental relationships and challenges for society. The importance of this nexus was re-emphasised at the UN Conference on Sustainable Development (Rio+20) in June 2012. The outcome document adopted at Rio+20 "The Future We Want" noted: *"We recognize the key role that ecosystems play in maintaining water quantity and quality and support actions within respective national boundaries to protect and sustainably manage these ecosystems"* UNCSD (2012, para 122). Wetlands are a fundamental part of local and global water cycles and are at the heart of this nexus. We also expect wetlands to be key to meeting the Millennium Development Goals (MDGs) and the future Sustainable Development Goals (SDGs).

Wetlands are essential in providing water-related ecosystem services, such as clean water for drinking, water for agriculture, cooling water for the energy sector and regulating water quantity (e.g. flood regulation). In conjunction with their role in erosion control and sediment transport, wetlands also contribute to land formation and therefore resilience to storms. Moreover, they provide a wide range of services that are dependent on water, such as agricultural production, fisheries and tourism.

Notwithstanding the high value of the ecosystem services that wetlands provide to humankind, wetlands continue to be degraded or lost due to the effects of intensive agricultural production, irrigation, water extraction for domestic and industrial use, urbanisation, infrastructure and industrial development and pollution.

In many cases, policies and decisions do not take into account these interconnections and interdependencies sufficiently. However, the full value of water and wetlands needs to be recognised and integrated into decision-making in order to meet our future social, economic and environmental needs. Using the maintenance and enhancement of the benefits of water and wetlands is, therefore, a key element in a transition to a green economy.

We thank the Norwegian, Swiss and Finnish Governments for their support of this initiative and welcome this publication, produced by The Ramsar Convention on Wetlands, the Convention on Biological Diversity (CBD), the Institute for European Environmental Policy (IEEP), the International Union for Conservation of Nature (IUCN), the Helmholtz Centre for Environmental Research (UFZ) and Wetlands International. It is an invaluable reminder of the key role that wetlands, some of the most biodiverse regions on our planet, play in our societies and economies.

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Questions this report addresses

The report responds to the following questions by presenting insights from experience from across the globe:

- *Benefits and risks of loss:* what are the roles of wetlands in providing water and wider ecosystem services and what are their values?
- *Measuring to manage:* how can we improve what we are measuring to help improve governance of our natural capital?
- *Integrating the values of water and wetlands into decision making:* what needs to be done to improve the consideration of the values and benefits of water and wetland in policy developments and in practical decision making?
- *Transforming our approach to water and wetlands:* what are the recommendations for transforming the regional, national and international approaches for managing water, wetlands and their ecosystem services?

I. WATER AND WETLANDS: WHAT BENEFITS DO WE DERIVE AND WHAT DO WE RISK LOSING?

Water security is a major and increasing concern in many parts of the world, including both availability and quality of water. Understanding the value of water and wetlands helps provide a firm foundation for protection and restoration of these resources, and thereby contributes to delivering more secure water supplies, while improving water allocation and management decisions.

Wetlands and the water cycle

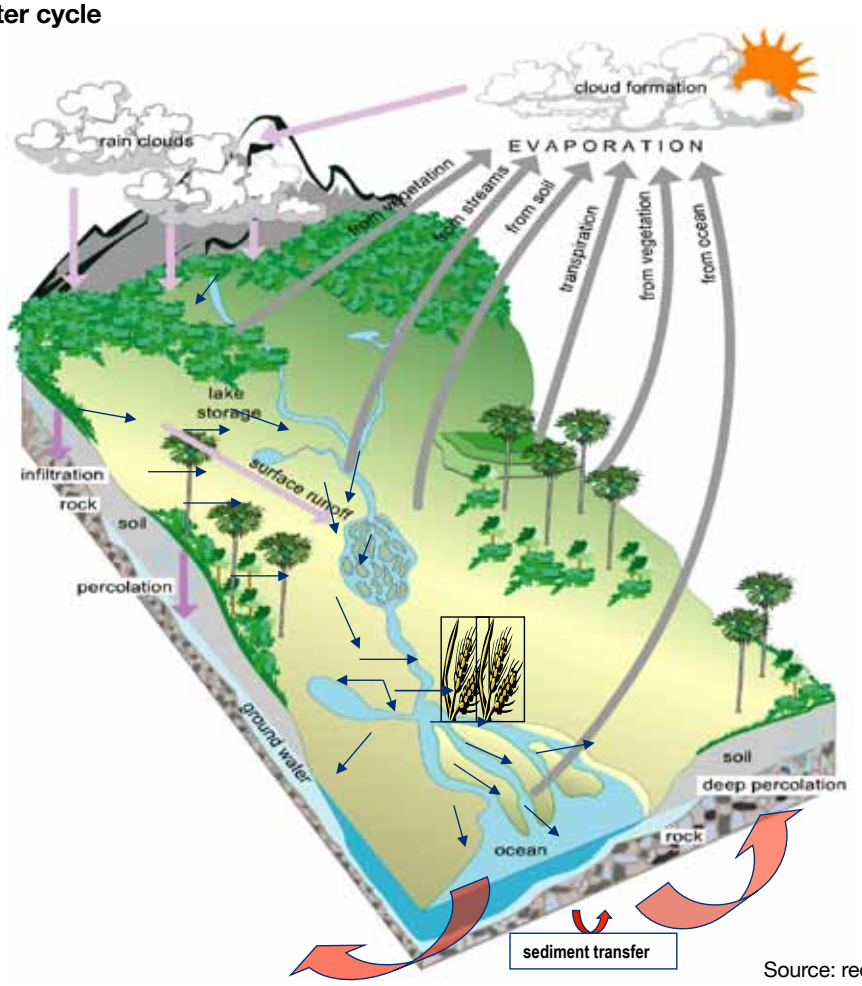
The global and local water cycles are strongly dependent on wetlands (see Figure 1, Ramsar, 1971; MA, 2005; SCBD, 2012). Land cover affects water retention and flows and hence the availability of surface and ground waters. Transpiration from plants affects rainfall patterns. Biodiversity plays a critical role in the nutrient cycle and carbon cycles (carbon stored, sequestered and released from biomass). A loss of biodiversity can compromise the functioning of these cycles, leading to major impacts on people, society and the economy.

Without wetlands the water cycle, carbon cycle and nutrient cycles would be significantly altered. In turn, water cycles are of paramount importance to biodiversity and to the functioning of essentially all terrestrial and coastal ecosystems.

Wetlands: A Definition

The Ramsar Convention defines wetlands as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres." (Article 1, Ramsar Convention on Wetlands, 1971). This report adopted this definition and hence covers both inland (e.g. lakes, rivers and marshes) and coastal wetlands (e.g. tidal flats, mangroves, salt marshes and coral reefs).

Figure 1 The water cycle



Source: redrawn from MRC (2003)

Wetlands deliver multiple co-benefits of significant social and economic values, and hence can help address a wide range of needs and objectives.

Ecosystems provide a range of services that benefit people, society and economy at large, which are known as **ecosystem services** (MA, 2005). Many of these ecosystem services are related to water and wetlands via water provision, regulation, purification, and groundwater replenishment, and are crucial in addressing objectives of **water security** and **water for food security.** Other ecosystem services provided by wetlands play important roles in relation to **nutrient cycling,** climate change (climate mitigation and adaptation), **food security** (provision of crops and nurseries for fisheries), **job security** (maintenance of fisheries, soil quality for agriculture) and a range of cultural benefits, including **knowledge** (scientific and traditional), **recreation and tourism**, and formation of **cultural values**, including identity and spiritual values.

Wetlands provide multiple benefits to cities and rural communities

In Sri Lanka, flood attenuation and wastewater treatment provided by the 3000 ha Muthurajawela Marsh near Colombo have been valued at over US$5 million/year and US$1.6 million/year respectively. This exceeds the value of the wetland for agricultural production (around US$0.3million/year) more than twentyfold.

Source: Emerton and Kekulandala 2003

In rural areas, wetlands provide multiple benefits that are vital to local communities. For example, the water tank system in Kala Oya, Sri Lanka, provides water for domestic use and livestock, fish and wild plants with benefits for the majority of households exceeding those from rice cultivation.

Source: Vidanage et al. 2005

Wetlands are particularly important providers of all water-related ecosystem services as they are essential sources of water. They regulate water quantity (including availability of surface water), groundwater recharge, and can contribute to regulating floods and the impacts of storms. Lesser known, but no less important, wetlands particularly help in erosion control and sediment transport, thereby contributing to land formation and increasing resilience to storms. All these ecosystem services improve water security, including security from natural hazards and climate change adaptation. The final Rio+20 declaration "The Future We Want", inter alia, recognised the role of ecosystems in the supply of water and its quality (para. 122, UNCSD, 2012).

Restoring coastal habitats can help save costs for coastal protection

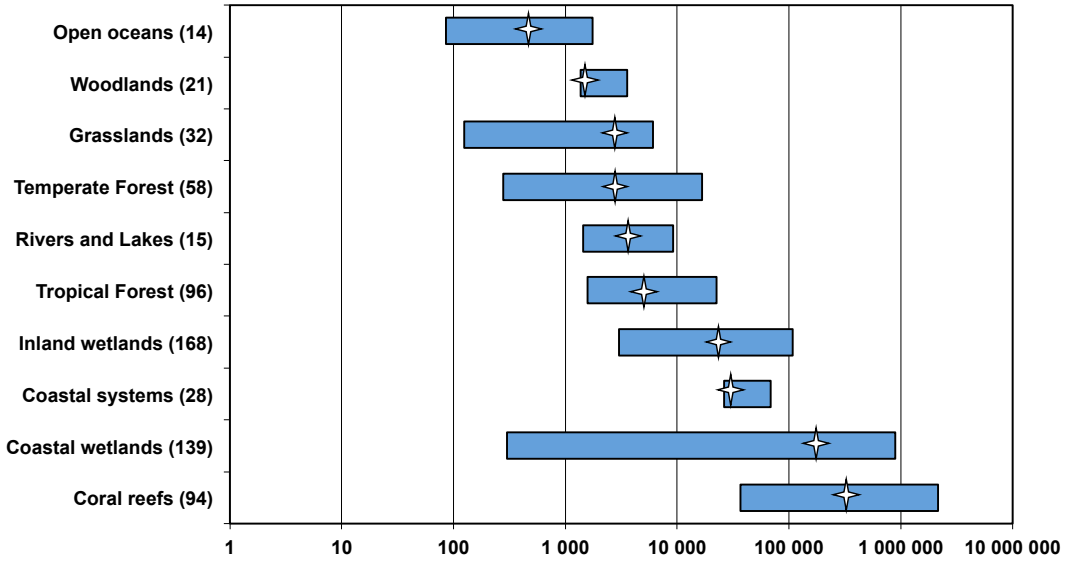
In the UK, sea walls have been built to protect land from erosion and flood events. Their maintenance is cost intensive and it is increasingly recognised, that these defences cause the degradation or loss of coastal and intertidal habitats (e.g. mud flats and salt marshes), and the ecosystem services they provide, in particular coastal protection and flood defence. Through deliberate breaching of the sea walls the coastline realigns further inland and the coastal ecosystems and their ecosystem services are restored. In the Humber estuary, this option of managed realignment was found to have a positive net present value after around 30 to 40 years, reaching a benefit of about £11.5 million over a period of 50 years. Over the same period, the maintenance of the sea walls would result in more costs than benefits. Managed realignment is in particular an option in rural areas, where opportunity costs of land are low.

Source: Turner et al. 2007

Values of both coastal and inland wetlands ecosystem services are typically higher than for other ecosystem types. The literature underlines that wetland ecosystems can have some of the highest ecosystem service values compared to other ecosystems. This is due to the importance of clean water provision, natural hazards mitigation (e.g. mangrove forests and floodplains), and carbon storage (e.g. in peatlands, mangroves and tidal marshes) (see Figure 2, TEEB, 2010; de Groot et al., 2012; Table 1 and Barbier 2011)[1]. A large proportion of the values reported for most types of wetlands come from their water-related services.

[1] It has to be noted that ecosystem functions, the flow of ecosystem services, and the economic value to society are site specific and depend on the ecological, social and economic systems and their interactions. As such, the values derived in a particular valuation study are very site-specific and cannot be easily extrapolated to another site/location. For this reason, the values presented in Figure 2 should be taken with caution and considered as indicative. For further discussion see value transfer in TEEB (2010) Chapter 5.

Figure 2 Range of values of all ecosystem services provided by different types of habitat (Int.$/ha/yr2007/ PPP-corrected)[2]



Note: The figure above shows range and average of total monetary value of bundles of ecosystem services per biome. The total number of values per biome is indicated in brackets; the average value of the value range is indicated as a star sign.
Source: de Groot et al. (2012) building on TEEB (2010).

Table 1 Wetland Ecosystem Services and related ecosystem structures and functions

Ecosystem services	Ecosystem structure and function
Coastal protection	Attenuates and/or dissipates waves, buffers winds
Erosion control	Provides sediment stabilisation and soil retention
Flood protection	Water flow regulation and control
Water supply	Groundwater recharge/discharge
Water purification	Provides nutrient and pollution uptake, as well as retention, particle deposition
Carbon sequestration	Generates biological productivity and diversity
Maintains fishing, hunting and foraging activities	Provides suitable reproductive habitat and nursery grounds, sheltered living space
Tourism, recreation, education and research	Provides unique and aesthetic landscape, suitable habitat for diverse fauna and flora
Culture, spiritual and religious benefits, besquest values	Provides unique and aesthetic landscape of cultural, historic or spiritual meaning

Source: Barbier 2011

[2] The international dollar, or the Geary–Khamis dollar, is a hypothetical unit of currency that is used to standardise monetary values across countries by correcting to the same purchasing power that the U.S. dollar had in the United States at a given point in time. Figures expressed in international dollars cannot be converted to another country's currency using current market exchange rates; instead they must be converted using the country's PPP (purchasing power parity) exchange rate. 1Int.$=1USD. Wetland valuation studies have focused most on ecosystem services such as recreation, coastal habitat-fishery linkages, raw materials and food production, and water purification, and more recently on the storm protection service of coastal wetlands.

Improved understanding and knowledge will help integrate the value of wetlands and their role in providing key ecosystem services into decision making at local, national and international scales. Incomplete understanding of these can result in favouring provisioning ecosystem services, whose values are well reflected in markets (e.g. food, timber), over regulating and supporting services, which are largely invisible in markets (e.g. water purification, flood and storm protection, nutrient cycling).

While the value of wetlands for water supply can be considerable, an additional advantage of maintaining them is that **wetlands also deliver multiple co-benefits of significant social and economic values, and hence can help address a wide range of needs and objectives.** Wetlands act as carbon sinks, helping reduce **climate change**, and for this reason their degradation (e.g. draining peatlands) can lead to very significant greenhouse gas emissions. Wetlands also regulate sediment transport thereby contributing to **land formation** and **coastal zone stability**. Mangroves can have important fish nursery functions and provide an important source of protein, livelihoods, as well as materials and fuel. These benefits merit a significant re-evaluation as to their importance in order to take them into account in the policy-making process (MA, 2005b; TEEB, 2010; TEEB, 2011a; TEEB, 2012a; TEEB, 2012b).

Wetland restoration provides a range of benefits

30,000 ha of degraded peatland were restored in the state of Mecklenburg-Western Pomerania, Germany between 2000 and 2008. Thereby emissions from degraded peatland of about 300,000 tCO_2-equivalents are avoided every year.

Assuming a marginal cost of damage caused by carbon emissions of 70€ per tCO_2, the benefit of avoided damage is up to €21.7 million every year (on average €728 per ha). In addition to the creation of habitat for biodiversity, peatland restoration also enhances water retention in the landscape, buffering against climate extremes, such as floods and droughts, and thereby facilitates climate change adaptation.

Source: Schäfer 2009

In Louisiana, land loss has already claimed 1,880 square miles of coastal wetlands since the 1930s. In order to address this problem, a Master Plan for the Coasts was approved in May 2012. The Master Plan is based on a two-year scientific analysis, which was used to select 109 high performing projects that could deliver measurable benefits in terms of flood risk reduction and sustainable land building, as well as enhancing the provision of ecosystem services. The projects were chosen on the basis of a wide range of environmental, economic and social criteria, including ecosystem services such as freshwater availability, oyster and shrimp provision, carbon sequestration and nutrient uptake. The Master Plan will inform Louisiana's coastal investments for the next 50 years, with a total investment of $50 billion in restoration projects (e.g. bank stabilisation, barrier island/headland restoration, hydrological restoration, marsh creation, oyster barrier reef establishment) and risk reduction projects (e.g. levees and elevating homes).

Source: Louisiana's 2012 Coastal Master Plan http://www.coastalmasterplan.louisiana.gov/

Wetlands are some of the most important biodiverse areas in the world and provide essential habitats for many species. The global Ramsar Convention network of "Wetlands of International Importance" (Ramsar Sites), which comprises over 2,000 sites covering over 1.9 million km^2 (up to 15% of estimated global wetland area), supports unique biodiversity in ecosystems (e.g. coral reefs, peatlands, freshwater lakes and marshes and mangroves), species (e.g. waterbirds, amphibians and wetland-dependant mammals such as hippopotamus, manatees and river dolphins) and genetic diversity.

Examples of major wetlands in the Ramsar Site network include the Danube Delta in Romania and the Ukraine; the Waddensea across the Netherlands, Germany and Denmark; the Everglades in the USA; the Pantanal wetlands across Brazil, Bolivia and Paraguay; the Hawizeh Marshes in Iraq; the Okavanga Delta in Botswana; the Sundarbans in Bangladesh; Bahia Adair in Mexico; the Camargue in France; the arctic tundra of Queen Maud Gulf in Canada; the Volga Delta and southern Lake Baikal in the Russian Federation; Wasur National Park in Indonesia; Kakadu National Park in northern Australia; the forest, lake and river systems of Grands affluents and Ngiri-Tumba-Maindombe in Congo and Democratic Republic of Congo; and Lake Tchad across Tchad, Niger and Nigeria.[3]

Working with nature can be a cost-effective way of meeting a range of policy, business and private objectives

Wetlands provide natural water infrastructure that delivers a wider range of services and benefits than corresponding man-made water infrastructure and can do this at lower cost. They are also an important, but poorly recognised, **complement to man-made infrastructure in river basin planning**

[3] Information on all Ramsar Sites is available on: http://ramsar.wetlands.org/

and management efforts. Wetlands can, for example, provide protection against coastal and river flooding to (partially) offset the need for man-made (built) infrastructure whilst, at the same time, providing a multitude of other services (e.g. recreation and tourism, carbon storage, provisioning services). Nature-based solutions can constitute a lower cost approach than alternative built capital solutions or offer significant cost savings where an integrated natural and man-made infrastructure approach is adopted.

Integrated water resource management should take account of these wider benefits to balance the needs of humans and nature and help enhance water security through maintaining biodiversity and ecosystem services, thereby providing cost-effective and sustainable options. These options can also be applied at larger scales (Vörösmarty et al., 2010). Examples include water provision and filtration, waste water treatment and flood control. As regards waste water treatment, there are ecological engineering solutions that combine man-made approaches with nature, for example by installing man-made wetlands/ ponds. However, while nature provides important waste management services, care is needed to not breach ecological limits, both for biodiversity reasons and as the functions and services of the wetland itself may be impaired.

In addition to direct water services, wetlands can offer cost effective solutions for other global environmental challenges, such as climate change mitigation through peatlands protection and restoration and climate change adaptation through mangroves, which can help reduce damage from increasingly frequent storms. Peatlands cover 3% of the world's land surface, about 400 million hectares (4 million km^2), of which 50 million hectares are being drained and degraded, producing the equivalent of 6% of all global CO_2 emissions (Crooks et al., 2011).

Wetlands degradation continues, despite their values

Status and trends of wetlands. Inland wetlands cover at least 9.5 million km^2 (i.e. about 6.5% of the Earth's land surface) with inland and coastal wetlands together covering a minimum of 12.8 million km^2 (Finlayson et al., 1999; UNEP, 2012). Since 1900, the world has lost around 50% of its wetlands (UNWWAP, 2003). Recent coastal wetland loss in some places, notably East Asia, has been up to 1.6% a year (Gong et al., 2010), and is on-going. Taking mangroves as an example, 20% of total coverage (3.6 million hectares) has been lost since 1980, with recent rates of loss of up to 1% per year (FAO, 2007).

Degradation of the remaining wetlands can lead to biodiversity loss, changes to ecological functions, and changes to ecosystem service flows with subsequent impacts on the health, livelihoods and wellbeing of communities and economic activity. For example, eutrophication of inland freshwater wetlands and coastal wetlands can lead to the ecosystem becoming algae dominated, which in turn leads to declines of fish availability, health risks and reduction in recreation and tourism opportunity and, for coastal reefs, also reductions in natural hazard management (SCBD, 2010). Pressures on wetlands include conversion (e.g. wetland drainage), invasive species, pollution, siltation, over-exploitation (e.g. unsustainable harvesting of fish), excessive water withdrawals (e.g. for irrigated agriculture), nutrient loading (e.g. from fertiliser use and urban waste water) and climate change (e.g. temperature rises thereby changing ecosystem conditions).

Human drivers of ecosystem change pose a threat to water security for 80% of the world's population (Vörösmarty et al., 2010). In developed countries costly technical solutions for water treatment are used to reduce some of these negative effects, but do little to address the source of the problem. Developing countries often cannot afford such costly capital approaches to water management.

To address the economic drivers of ecosystem change, there is a need to mainstream ecosystem services into economic decisions. The Millennium Ecosystem Assessment concluded that many water resource developments that have been undertaken to increase access to water have not given adequate consideration to the harmful trade-offs with other ecosystem services provided by wetlands (MA, 2005). An increased appreciation of the societal values of water-related ecosystem services from nature and the wider range of wetland ecosystem services will be essential to catalyse appropriate policy and business responses.

II. MEASURING TO MANAGE

An improved evidence base on the **interconnections between wetland ecosystems and social and economic systems will support improved management** of wetlands. Furthermore, **assessing the value of water and wetlands** can help **demonstrate their importance** in the decision-making processes at different levels, across both public and private sectors. A diverse range of tools help identify, demonstrate and take account of the benefits of water and wetlands (TEEB, 2010; TEEB, 2011a; De Groot et al., 2006). Valuation of these benefits can make use of a mix of qualitative, quantitative, spatial, and monetary approaches. Particularly important are biophysical assessments, as well as natural capital accounts.

- **Indicators** on the state and trends of biodiversity and on the flow of ecosystem services are a critical evidence base for decision making at all levels. Indicators can identify levels and changes in water quality and quantity, biodiversity or ecosystem services such as carbon sequestration, water retention in soils, and the number of people benefitting from ecosystem-provided clean water.

- **Mapping** the location and extent of wetlands, along with their interrelationships with ecosystems, population centres and man-made infrastructure provides essential insights on their interdependencies. Communities can be dependent on the ecosystem service flows from a wetland and the wetland health and functions can be dependent on the management by the local community. Furthermore, flood management for cities can benefit from a combination of wetlands and human-made infrastructures, and understanding their complementarity can be fundamentally important for land use planning, management and investment choices.

- **Natural capital and environmental economic accounts** are systematic ways of collating the biophysical evidence base and associated values at regional or national levels . They give policy makers tools to complement national economic accounts. Tools and approaches for environmental accounts at the national level include the UN System of Environmental-Economic Accounts (SEEA), the Ecosystem Capital Accounts being developed by the European Environment Agency (EEA, 2011) and a range of national approaches. At the private sector level, emerging developments include corporate sustainability reporting and accounting - such as Environmental Profit and Loss Accounts and the Natural Capital Declaration of the financial sector (Puma, 2011; Natural Capital Declaration, 2012; TEEB, 2012b).

- **Assessing the value of nature can help communicate the importance of wise use of nature, the benefits of investing in natural capital and the importance of avoiding its degradation.** There are a number of approaches to highlighting the values derived from nature, ranging from ecosystem service indicators, maps demonstrating the flows of ecosystem benefits, to monetary valuation. Each approach has strengths and limitations, and decision-makers may typically rely on a mix of qualitative, quantitative, and monetary assessments. A range of initiatives are supporting the wider valuation, from corporate ecosystem valuation to support environmental profit and loss accounts, business planning and improved disclosure (WBCSD, 2011; TEEB 2012a), to valuation for municipal and regional authorities (TEEB 2011b, TEEB 2012a), for policy makers (TEEB 2010) and for site managers (Kettunen et al 2013 forthcoming). It is important to understand that identifying the value of nature does not suggest that nature be traded in the market and hence commoditised. Furthermore, an economic valuation does not necessarily imply a policy response using market-based instruments, as there are many instruments that can be used to reflect the value of nature (ten Brink et al 2012).

III. THE VALUES OF WATER AND WETLANDS SHOULD BE FULLY INTEGRATED INTO DECISION MAKING

The Ramsar Convention, with its 163 government signatories (Contracting Parties) and its current Strategic Plan 2009-2015, commits Parties to implementing wise use principles for water and wetlands. Actions by Parties to deliver wise use provide important initiatives for protecting key water and wetland services. Integrating the values of water and wetlands can facilitate and inform decision making for wise use.

The globally agreed **Strategic Plan for Biodiversity 2011-2020** (launched at the tenth meeting of the Conference of the Parties to the Convention of Biological Diversity in 2010 and supported by the Rio+20 Declaration) **includes commitments to raise awareness of the values of biodiversity and to integrate them into plans, strategies and accounts** (Aichi Biodiversity Targets 1 and 2). The 193 Parties to the CBD are currently revising their National Biodiversity Strategies and Actions Plans (NBSAPs) to take into account physical assessments of flows of ecosystem services as well as the growing number of initiatives to value nature by non-monetary and monetary means[4].

Working with wetlands can create policy synergies

Working with nature can be a cost effective way of meeting a range of policy, business and private objectives. This includes water, food and energy security (ensuring water security for agriculture and energy production), poverty alleviation and meeting Sustainable Development Goals (SDGs). Water and wetlands are at risk from climate change, sustainable management of these ecosystems can increase their resilience and hence reduce this risk. The sustainable use of water and wetlands, by protecting the services they provide, is critical to enable society to adapt to climate change and improve social cohesion and economic stability.

[4] see also www.teebweb.org for countries embarking on national assessments

Integrated decision making should be the new normal.

A range of tools have proved invaluable in helping to take the values of water and wetlands into account and realising synergies in policy, business and management decisions:

- **Land and water use planning and regulation** to ensure the sustainable provision of ecosystem services. This includes designating wetlands for water regulation benefits for rural or urban centres, defining non-conversion zones to safeguard mangroves that provide important public goods benefits, or protecting coastal areas for fisheries nurseries. In addition, Maritime Spatial Planning and Integrated Coastal Zone Management may help manage coastal wetlands and deal with the relevant trade-offs (e.g. between provisioning and supporting/regulating ecosystem services). Effective regulation and careful spatial planning helps control some critical pressures on wetlands, which in turn help avoid detrimental effects on provision of crucial local ecosystem services such as flood protection and water provision or global ones such as carbon storage.

- **Using wetland services to deliver investment and achieve management objectives,** by considering wetlands as natural water infrastructure that can offer solutions to meet water management objectives. Cost comparisons can often be favourable for the conservation or restoration of wetlands, even when considering water management alone (e.g. flood risk), and particularly when factoring in co-benefits on offer (e.g. recreation or tourism).

- **Investment** to conserve, restore and sustainably manage wetland ecosystem services can be critical to rural communities dependent on natural capital for food, water, fuel and livelihoods and global objectives of climate change mitigation and adaption. It can be a means of cost effectively achieving a range of policy and development objectives, including the Millenium Development Goals (MDGs) and the future SDGs.

Ecosystem restoration creates jobs and improves local livelihoods

In South Africa invasive species have negative impacts on ecosystems and the services they provide, in particular water supply, causing damage to the national economy. For clearing land from invasive species, the programme "Working for Water" was introduced in 1995, providing jobs and training to about 20,000 people from marginalised groups of society per year and thereby also contributing to poverty reduction. The programme "Working for Wetlands" is targeting in particular the restoration of wetlands. The restored Manalana wetland, for example, now contributes provisioning services, such as food, grazing and construction materials, valued at around R3,466 per year to about 70% of local households, in an area where half of the households have an income of less than R5,700 per year. The improvement in livelihood benefits was estimated to be twice as high as the costs of restoration

Source: DWAF: http://www.dwaf.gov.za/wfw/ Bushbuck Ridge Project: http://www.un.org/esa/sustdev/publications/africa_casestudies/bushbuck.pdf and Pollard et al. 2008

- **Price and subsidy reform** to encourage efficient use of resources and innovation. This can be done for example by moving to fuller cost recovery for water (paying for the costs of supply) and, where relevant, also by resource pricing (taking into account the value of the resource itself for society). Furthermore, making use of pollution charges, liability and compensation requirements (e.g. for pollution incidents or damage) can reduce the pressures on wetlands and help implement the polluter pays principle. Reforming subsidies can encourage management practices that protect public goods, promote innovation, reduce technological lock-ins and save public budgets for other objectives (Lehmann et al 2011, Withana et al 2012, OECD 2005, 2006).

- **Payments for ecosystem services** to remunerate land uses that deliver ecosystem services, through programmes funded either by government agencies to have public payments for public goods, private ecosystem services users (e.g. water utilities, beverage companies, citizens), foundations or NGOs. This supports the principle that the beneficiary pays and the provider of a service gets rewarded for sustainable practice.

Water Funds can be a tool to improve water management, while creating employment and ecosystem benefits

About 80% of the water for the 1.8 million inhabitants of the city of Quito, Ecuador, comes from three protected areas. Water users pay into the Quito Water Conservation Fund (FONAG) and FONAG invests the generated income (about US$ 800,000 per year) into projects for watershed protection. One of the main beneficiaries is the local communities that live close to the water sources. During 10 years FONAG has:

- Helped conserve the watersheds with a size of 500,000 ha;
- Involved 30,500 children in Environmental Education Programs;
- Reforested 2,033 ha with over 2,000,000 trees;
- Generated employment and engaged over 200 families in community development projects in rural basins.

Sources: Arias et al. (2010).

Synergies with policies aimed at enhancing livelihoods and alleviating poverty

Good water and wetland management can provide co-benefits by improving the health and livelihoods of local communities and reducing poverty, e.g. through sustainable fisheries, agriculture and tourism. When possible, projects aimed at improving wetland management should involve local communities and make use of traditional practices and local knowledge, as this both increases the local acceptance of the policy action and potentially provides more locally tailored techniques for ecosystem management. Good transition management is key to gaining wider acceptance and participation. It also supports the creation of employment opportunities for those who may lose their jobs because of conservation/ restoration policies.

Community access and benefit sharing are crucial to improve local livelihood

Despite the successful restoration of the Chilika lagoon, India, and a subsequent increase in fish stock, traditional fishermen remained in debt and conflicts about access and benefits persisted. A change in policies towards more traditional community-based management systems, taking ecological conditions into account, and giving more power to local fishermen, allowed local communities to benefit better from the improved fisheries. This shows that effective policies for access and benefit sharing are crucial for ensuring that the benefits of ecosystem services are reaching local communities.

Source: Kumar et al. 2011

IV. RECOMMENDATIONS: TRANSFORMING OUR APPROACH TO WATER AND WETLANDS

Wetlands and water-related ecosystem services should be at the heart of water management in the transition to a green economy. Key elements to transform our approach include:

- **Appreciating and taking account of the values of water and wetlands in public policy and private decisions.** This includes both developing a more complete knowledge of the economic importance of water and wetlands and committing to their integration into policy and investment decisions;

- **Committing to the wise use of wetlands and to integrated water resource management;**

- **Prioritising to avoid further loss/conversion of wetlands** by better and more comprehensive consideration of wetland ecosystem services in Strategic Environmental Assessment (SEA) of policies and programmes and project-level Environmental Impact Assessment (EIA).

- Developing **ecosystem capital accounts** to contribute to assessment of environmental problems, land use planning, regulation, setting of appropriate incentives and enforcement;

- **Promoting the restoration of degraded wetlands** to improve water, food and energy security, biodiversity conservation, climate benefits (mitigation and adaptation), natural protection against extreme events, and benefits for people and livelihoods. In places this will be done in conjunction with man-made infrastructure investments. For the public sector, restoration can be a critical means of ensuring the provision of public goods, addressing poverty (as the rural poor are generally more directly reliant on ecosystem services) and saving public finance (due to cost effective solutions of working with nature). For business, it can be a means of securing resources for the future and reducing resource availability risks. Restoration can also help in minimising liabilities, be part of a licence to operate (e.g. where restoration or offsets are required) and in some cases provide positive business opportunities (e.g. where water trading or PES schemes are in place); and

- **Ensuring equitable benefit sharing and social and economic efficiency**, as there will be winners and losers in the transition to a sustainable economy

There is a need for action at all levels and across stakeholders if the opportunities and benefits of working with water and wetlands are to be fully realised and the risks of losses appreciated and acted upon.

Practical recommendations for stakeholders to respond to the value of water and wetlands in decision-making

At the **global level**, there is a need to ensure implementation of the Strategic Plan for Biodiversity 2011-2020, the Ramsar Strategic Plan 2009-2015, the UNFCCC, the MDGs, and strategic planning and implementation of the many Multilateral Environmental Agreements (MEAs). The role and value of water and wetlands should be integrated in each of these, in order to improve water security and other water-related benefits. It is an awareness and governance challenge, with potential for significant synergies and efficiency gains, because investments in wetlands are investments in human welfare.

National and international policy makers

- Integrate the values of water and wetlands into decision making and national development strategies – in policies, regulation and land use planning, incentives and investment, and enforcement. Make full use of the NBSAPs (National Biodiversity Strategies and Action Plans) process to help with integration;
- Ensure that wetland ecosystem services options and benefits are fully considered as solutions to land and water use management objectives and development;
- Develop improved measurement and address knowledge gaps, using biodiversity and ecosystem services indicators and environmental accounts. This requires an improved science-policy interface and support for the scientific/research communities. The recently established Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)[5] could contribute significantly in this area;
- Reform price signals via water cost recovery, resource pricing and reforming environmentally harmful subsidies, so that they promote sustainability;
- Commit to restoration targets and/or programmes, improving ecosystem health and functioning, thereby achieving the multiple benefits of working with nature.

Local and regional policy-makers

- Assess the interactions between wetland ecosystems, communities, man-made infrastructures and the economy and ensure the evidence base is available to decision makers, whether spatial planners, permit authorities, investment programme authorities, inspectors or the judiciary;
- Integrate planning systems - e.g. water supply and management to take into account both ecosystem-based infrastructures and man-made infrastructures;
- Ensure due engagement/participation of communities (including indigenous peoples) and ensure that traditional knowledge is duly integrated into management solutions.

Site managers

- Assess the status and trends in wetland ecosystem services, including identification of components and processes that are required to sustain the provision of these services[6];
- Assess the interlinkages between livelihood systems and ecosystem services, particularly property rights and distribution of costs and benefits associated with ecosystem services provision[7];
- Develop site management plans to ensure wise use of wetlands, including sustained provision of ecosystem services[8];
- Use valuation of ecosystem services as a means to communicate the role of wetlands in the local and regional economy, support resource raising, or inform decision makers of the impacts and trade-offs linked with developmental policies impacting wetlands[9];
- Include mechanisms for capturing ecosystem service values as incentives for the stewardship of local resource use within management plans. Where possible and relevant, use tools such as payments of ecosystem services, taxes and other economic instruments to rationalise incentives linked with ecosystem services;

[5] http://www.ipbes.net.
[6] See Ramsar Handbook 1: Concepts and approaches for wise use of wetlands and 15: A Ramsar Framework for wetland inventory and ecological character description for guidance on the topic
[7] Ramsar Resolution XI.13: An integrated framework for linking wetland conservation and wise use with poverty eradication
[8] See Ramsar Handbook 18: Managing wetlands
[9] See Ramsar Technical Report 3: Valuing wetlands: Guidance for valuing the benefits derived from wetland ecosystem services

- Identify co-benefit opportunities for achieving development sector outcomes (for example, food and water security) by mainstreaming wetland ecosystem services in sectorial policies;

- Communicate ecosystem service values at the local level - to get buy-in for site management, attract funding for protection and management measures, and reduce the pressures on wetlands, including risks of land use permit decisions that may undermine public goods[10].

Academia

- Contribute to fill knowledge gaps on the values of water and wetlands, on improved governance solutions, on measures and tools to support the development of environmental accounts;

- Improve knowledge of the hydrological functions of wetlands and how these influence ecosystem services within and beyond wetlands;

- Improve the understanding of public goods and the trade-offs between public goods and private benefits from policies and investment choices.

Development cooperation community

- Integrate the appreciation of the multiple values of wetlands and potential cost savings to meet the objectives of development cooperation (e.g. ecosystem restoration to improve water security, poverty alleviation, local development and wellbeing; investment in ecosystem-based adaptation to climate change).

Non-Governmental Organisations (NGOs)

- Support wetland management via funding and expertise, including engaging volunteers to help with monitoring, science and restoration;

- Understand, demonstrate and communicate the value of wetlands. Work with other stakeholders to help identify and carry out practical responses.

Business

- Identify impacts and dependencies of business on water and wetlands related-ecosystem services in the short to long term. Assess the risks and opportunities associated with these impacts and dependencies;

- Develop corporate ecosystem valuation and environmental profit and loss accounts to improve disclosures;

- Take action to avoid, minimise and mitigate risks to biodiversity and ecosystem services. Realise opportunities for synergies between private interests and public goods, whether via restoration activities, engagement in markets or wider commitments to no net loss of biodiversity (or net gain). Commit to water footprint reduction, in order to safeguard future resource availability for private and public benefits.

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[10] See Ramsar Handbook 6: Wetland CEPA

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This report presents insights on both critical water-related ecosystem services and also on the wider ecosystem services from wetlands. The objective is encourage additional policy momentum, business commitment, and investment in the conservation, restoration, and wise use of wetlands. The report seeks to show how recognising, demonstrating, and capturing the values of ecosystem services related to water and wetlands can lead to better informed, more efficient, and fairer decision making. Appreciating the values of wetlands to both society and the economy can help inform and facilitate political commitment to policy solutions.

TEEB Water and Wetlands is about the “water - wetlands - ecosystem services” interface – it concerns the importance of water and its role in underpinning all ecosystem services and the fundamental role of wetlands in global and local water cycles. It is also about the wide range of ecosystem services provided by nature to people and the economy that need to be taken into account to ensure that the full benefits of nature are not overlooked. It is about the “values” of nature which can be expressed in a number of ways and methods, including qualitative, quantitative and monetary indicators.

This report aims to support evidence-based decision making by presenting an array of ecosystem service values in varying contexts.

TEEB Water and Wetlands aims to contribute towards the wise use of wetlands through creating better understanding of ecosystem service values and benefits and their integration in decision making at all levels.