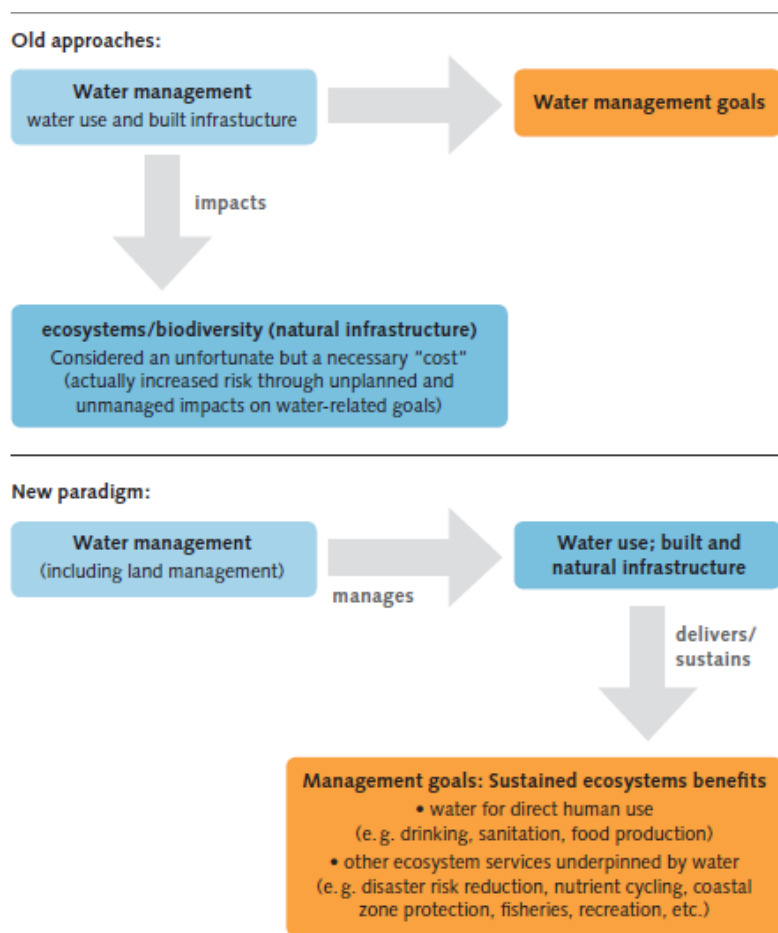


## Strategies for a Green Economy: Investing in Nature as Water Infrastructure

### What is natural infrastructure?

With the term infrastructure defined as ‘the stock of facilities, services and installations needed for the functioning of a society’, nature is part of the infrastructure portfolio of every country and every economy. Nature is then ‘natural infrastructure’ (or ‘green infrastructure’) based on its capacity to complement, augment or replace the services provided by traditional engineered infrastructure.



Services from ecosystems underpin each of water, food and energy security, whether in terms, for example, of abundance of fish, flows to turn turbines or water stored to mitigate scarcity and supply irrigation. Nature helps mediate the links in the nexus of water, food and energy securities, by storing, moving, cleaning and buffering flows of water, making drought and flood less severe and food and energy production more reliable. Without healthy ecosystems in well-functioning watersheds, the infrastructure built for irrigation, hydropower or municipal water supply does not function sustainably, and is unlikely to achieve the economic returns necessary to justify investments. Nature is part of the infrastructure needed to manage the nexus and its resilience.

**Figure 1.** Evolving approaches to the water-ecosystem nexus (Source: R. Ardakanian & D. Jaeger (ed), 2012, Water and the Green Economy, Capacity Development Aspects, UNW-DPC)

Understanding the role of nature as water infrastructure changes the picture of what investment is needed to ensure water, food

and energy security. Nature and ecosystem services then become part of the investment focus for economic development and for water, food and energy security, as a complement to built infrastructure rather than a competitor, and thus as a keystone of a future green economy (See Figure 1). The results from such investment should be accounted for in terms of economic returns and water, food and energy security, as well as, critically, social equity and resilience.

### Valuing natural infrastructure

The key to working with ecosystems in the green economy and the water-food-energy nexus is the application of analytical tools for, first, quantifying the services provided by ecosystems and, second, estimating their economic value. Economic valuations for the infrastructure benefits of ecosystem services are based on, especially, market prices for products (e.g., wetland fisheries), the cost of replacing ecosystems through engineering (e.g., water filtration) or the costs of damage avoided (e.g. flood attenuation).

With valuations for natural infrastructure in hand, decision makers can weigh up the costs and benefits of alternate choices for infrastructure development and operation, with a more complete picture of cost effectiveness and broader impacts on sustainable development.

Integrating values for natural infrastructure into cost-benefit analysis for infrastructure opens the possibility of optimizing infrastructure development for a river basin. It would then be possible to identify mixed portfolios of engineered and natural infrastructure that would best meet multiple development objectives such as hydropower generation, agricultural water supply, fisheries productivity, biodiversity conservation and climate resilience. New analytical tools are needed, but such analysis should guide investment at basin level and be used to equip stakeholders with evidence that helps lower conflict over infrastructure and build consensus.

### Why invest in natural infrastructure?

Clean and regular water supplies are among the most basic human needs, as well as being core to most industries and to food and energy security. Each year, hundreds of billions of dollars are invested in the equipment and facilities that are required to abstract, store, treat and distribute water. Such investments, however, have paid scant attention to some of the most important, and productive, components of water infrastructure: these are the ecosystems – wetlands, forests, grasslands and other natural habitats – that provide a wide array of services to maintain water supplies, uphold water quality and guard against water-related hazards such as pollution, storms, floods and droughts.

Sustainable river basin management pays dividends for poverty reduction, water security and economic development. Conventional water investments, however, ignore the economic role of river basins themselves and ecosystems as natural water infrastructure. They omit the natural ecosystems which safeguard and maintain water quality and supplies, protect against water-related disasters and generate goods and services that are vital for human well-being and economic development.

## Policies supporting investment in natural infrastructure

**Ensure that ecosystems are an integral part of water infrastructure** necessary for development, both at basin and national level. The costs and benefits of ecosystem services need to be valued for investment, including for dams, storage, irrigation and drainage. Economic planning and investment decisions should be based on analysis of costs and benefits for the full suite of both natural and built infrastructure options. Leaving natural systems out of the planning process can be costly.

For example, in Nigeria's Komadugu Yobe Basin (KYB), upstream of Lake Chad, engineers built dams to supply freshwater to an expanding population without considering the impact on the ecosystem and subsequent loss of income to subsistence farmers downstream. New streamflow patterns altered yearly droughts, allowing the invasive weed *Typha* to constrict flows, stopping navigation and fishing. To overcome this situation, IUCN's KYB Project started with a water audit, identifying water availability and needs. Though it took time, its transparent nature helped build trust. A fragmented and uncoordinated management system was transformed into State Integrated Water Resource Management (IWRM) Committees. Convinced that river restoration would pay dividends, Nigeria's President set up a \$125 million Trust Fund to finance investment in the restoration of the KYB. To create an initial \$13 million investment, authorities across the six riparian states matched the Federal government's contribution. Investment in the natural infrastructure of the basin means that river channels are being cleared, restoring wetlands for fisheries and allowing navigation. But more importantly, the Trust Fund is building investment in sustainable water management for the future.

**Include ecosystem valuation in water investment decisions**, to ensure that the returns on investment for river basin management are clear and quantified to inform better decision making. Valuation of ecosystem services can help supply the tools to make better economic decisions about threats to the environment. Economic tools are used to create a business case in which the dividends from investing in river basin management account for the benefits of ecosystems and water security for livelihoods and economic development.

In Sri Lanka, the Muthurajawela Wetlands control flooding and filter waste and pollution, while providing income opportunities through tourism and fishing. Though a wetlands management plan has been in place for several years, low levels of compliance meant that biodiversity and water services were lost through land reclamation and contamination from factory discharge. A valuation assessment revealed the

	Value (\$/year)	Value (\$/ha/year)
Flood attenuation	5,394,556	1,758
Industrial wastewater treatment	1,803,444	588
Agricultural production	336,556	110
Support to downstream fisheries	222,222	72
Firewood	88,444	29
Fishing	69,556	23
Leisure and recreation	58,667	19
Domestic sewage treatment	48,000	16
Freshwater supplies	42,000	14
<b>TOTAL</b>	<b>8,072,111</b>	<b>2,631</b>

**Figure 2.** Economic Value of Muthurajawela Wetland, Sri Lanka (Source: L. Emerton (ed), 2005, Values and Rewards: Counting and Capturing Ecosystem Water Services for Sustainable Development, IUCN)

marsh's highest economic benefits are services such as flood control and waste treatment, followed by income from fisheries and agriculture. The valuation showed the benefit of wetland restoration, not only for the 30,000 vulnerable people who profit directly from income, employment and food security, but also for businesses (See Figure 2). Conserving the marshes helps industries avoid the cost of building and maintaining the treatment plants necessary to replace the buffering effect of lost wetlands, saving almost \$3.6 million per year. Knowing the value of the ecosystem helps convince water users to comply with wetlands management to yield the highest possible return on development.

***Financing for water resources management must be sustainable.*** A sound business case needs to be made to mobilize innovative financing of water resources management, from governments, the private sector and water users. Increasing demand requires innovative ways of funding new infrastructure and promoting conservation. Economic incentives can encourage changes in behaviour needed to implement IWRM. For example, rewarding those who manage watersheds sustainably or making financing available to local initiatives for watershed management through decentralized funds and credit schemes that integrate clean and adequate water for all, ecosystem services, livelihoods and economic development.

Using payments for ecosystem services (PES) can effectively change the way water users behave and encourage implementation of IWRM and sustainable river basin management. The residents of San Pablo, Guatemala have found a way to reward improved management practices and overcome reluctance to change. The many rivers around San Pablo provide high value services, but over the years heavy logging and the resultant lack of ground cover caused aquifers to dry up, leading to almost daily water shortages. Contamination from coffee production reduced water quality, causing health problems. Understanding that their future was under threat, the community started the Participative Water Management Fund, Agua Viva (FOGESHIP), a legal institution, to implement a PES scheme. By raising urban water tariffs they are able to fund work plans for watershed management and restoration and compensate landowners for sustainably managing their forests. Because the whole community is involved, everyone has learned the value of the watershed. Working together they have created a rational, sustainable plan for the basin's resources.

### How to Invest in Natural Infrastructure

Investing in natural infrastructure is different than investing in conventional built infrastructure. Instead of top-down planning and decision making, working with natural infrastructure benefits from incorporating more bottom-up strategies and actions. Natural infrastructure options can therefore benefit social equity in development.

The key to investing in natural infrastructure is to identify priority management actions, and then what is needed to empower the relevant stakeholders to undertake implementation. Investment in natural infrastructure is then best made through packages that link planning and decision making to implementation. Critical ingredients are capacity building and governance that empower stakeholders to negotiate trade offs and build consensus on priorities. With these in place, and using an adaptive approach incorporating learning-by-doing, implementation becomes achievable.

Strategies for investing in natural infrastructure can readily be incorporated into broader infrastructure packages, but appropriate mechanisms for investment are needed that deliver financing for appropriate ecosystem management and support empowerment needed for implementation. The major forms of investment in natural infrastructure are:

***Strategic river basin investment*** – by incorporating natural infrastructure into capital investment projects for built water infrastructure. Infrastructure investment is then made for river basins in packages of built and natural infrastructure to achieve more cost-effective, sustainable and equitable river basin development.

***Payments for Ecosystem Services (PES)*** – to promote the conservation of upstream areas, and thus ultimately entire watersheds, through compensation for ecosystem-friendly land use practices. Environmental service fees have been established in a number of places around the globe, particularly in Latin America. PES encourages individuals and businesses to recognize the value of ecosystem services.

***Certifiable standards for watershed stewardship*** – to encourage widespread adoption of and investment in sustainable water management practices by companies and utilities globally.

**For Further Information:**

IUCN Water Briefing:

[http://www.waterandnature.org/sites/default/files/documents/pdf/economics\\_water\\_briefing.pdf](http://www.waterandnature.org/sites/default/files/documents/pdf/economics_water_briefing.pdf)

Putting Nature in the Nexus:

[http://www.iucn.org/about/work/programmes/water/resources/wp\\_resources\\_reports/](http://www.iucn.org/about/work/programmes/water/resources/wp_resources_reports/)

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