

→ Why Ecosystem-based Adaptation matters for the water sector

If you are searching for sustainable and cost-efficient solutions for water security in the face of climate change, this brief makes the case for why you should integrate Ecosystem-based Adaptation to climate change into your work.

This brief is part of a **series of papers** on the evidence of the effectiveness of EbA as a type of Nature-based Solutions. Find out why EbA matters for **cities**, in the **water** and the **agricultural sectors**.



CLIMATE CHANGE EXACERBATES WATER INSECURITY

Did you know that as of now, 80% of the global population's water security is at risk? The effects of a 2°C warmer climate would further aggravate this situation. Climate change combined with current trends in population growth and consumption patterns will make the already challenging task of providing enough water of adequate quality for consumption, sanitation, food production, and economic use increasingly impossible.

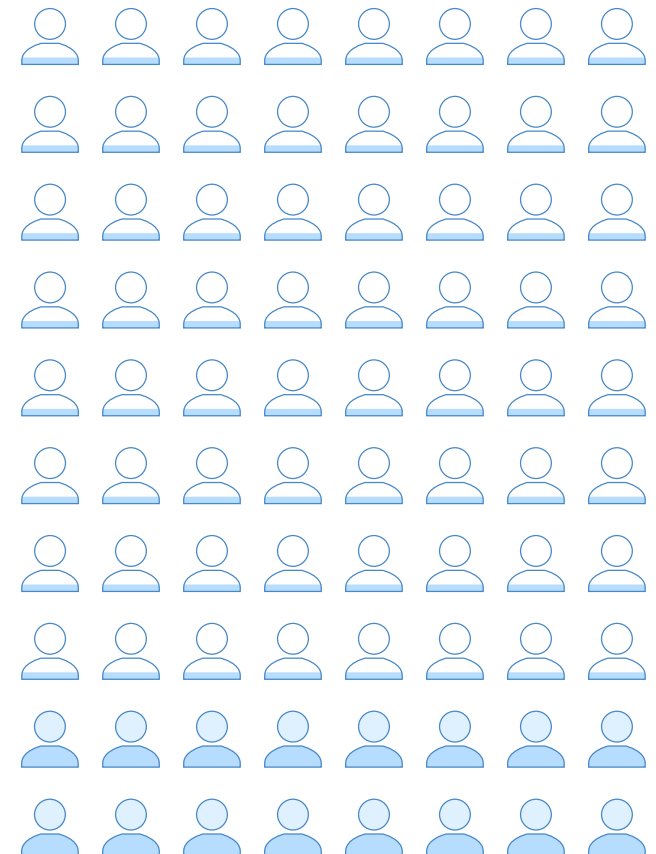
Equally, protection from water-related hazards will become more challenging, as many of the key climate change impacts will affect us through water. The water cycle will be altered by the changing climate everywhere: many humid regions will get even more rainfall, while dry regions will become dryer. Further, 90% of all disasters are water-related, (such as floods and droughts), and they are predicted to become more frequent, and more extreme, due to climate change.

Climate change also affects water quality – e.g. by impacting ecosystems like lakes, rivers, springs, and wetlands, which play an important role in storing and filtering freshwater. Protecting ecosystems therefore often protects safe access to clean water.

Ecosystems are at the centre of these changes. Their degradation is the main reason for an upsurge in water-related risks and extremes that destroy people's lives, livelihoods and (water and sanitation) infrastructure. Ecosystem-based solutions can help tackle and significantly reduce this risk.

ECOSYSTEM-BASED ADAPTATION IS PART OF THE SOLUTION

Strengthening and protecting ecosystems is a powerful solution – for the sake of nature and human well-being. Ecosystem-based Adaptation (EbA) solutions use ecosystems and their services to protect people from the adverse effects of climate change. According to the World Water Development Report 2018, the water saved by widespread use of EbA could exceed the projected water demand for 2050, providing enough water for food security and other uses.



80%

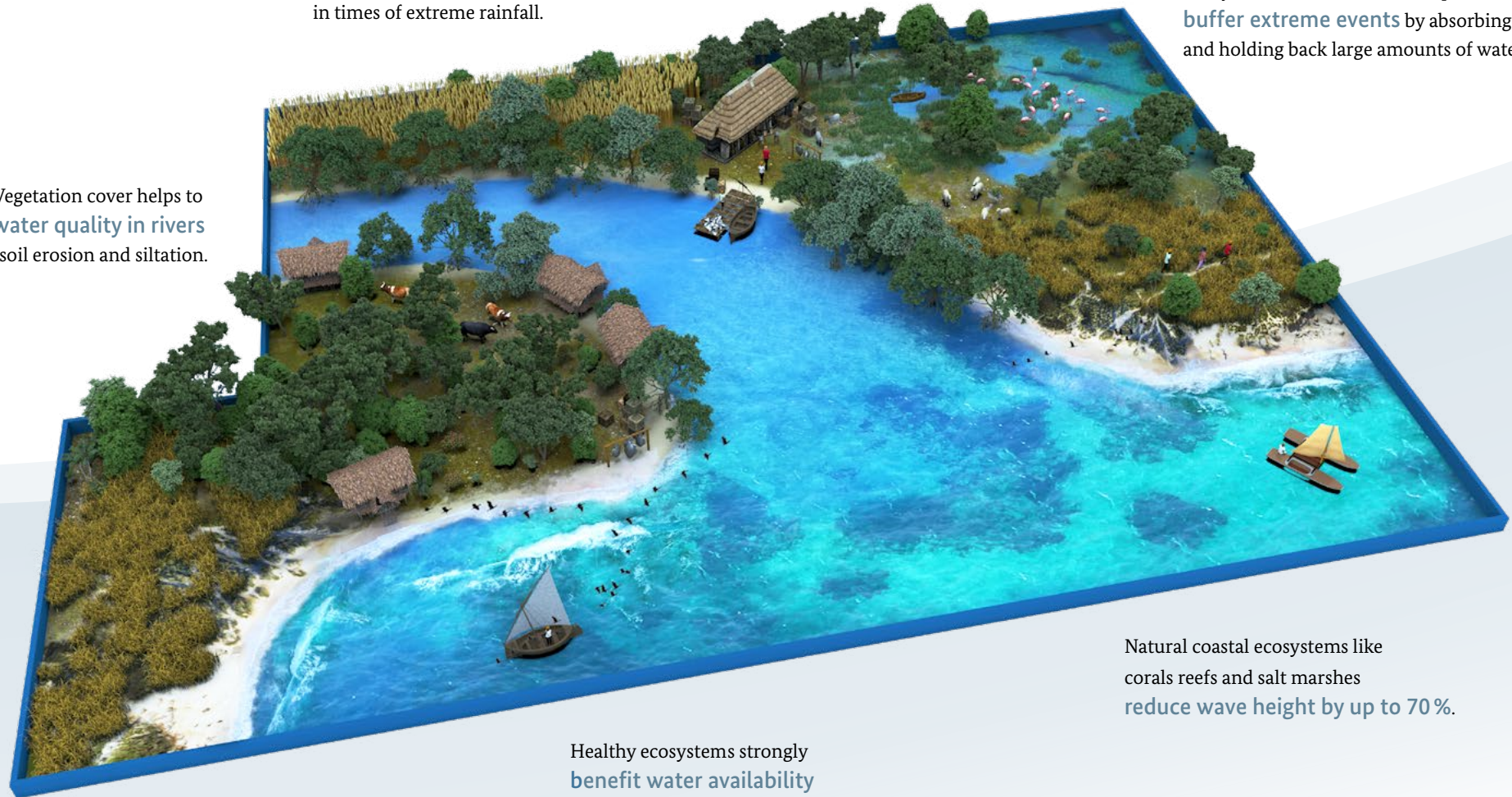
of the world's population
suffers serious threats
to its water security

What are the benefits of EbA in water management?

Reforestation of watersheds **lowers flood risk** in times of extreme rainfall.

Ecosystems like marshes and riparian forests **buffer extreme events** by absorbing and holding back large amounts of water.

Vegetation cover helps to **improve water quality in rivers** by reducing soil erosion and siltation.



Natural coastal ecosystems like corals reefs and salt marshes **reduce wave height by up to 70 %**.

Healthy ecosystems strongly **benefit water availability and security**.

Grasslands **absorb 50 to 80 % more water** than uncovered soil.

Ecosystems are central to water provision, regulation, and quality. Considering ecosystems in integrated watershed management ensures that their regulating services (storing and gradually releasing water during drier periods) can be protected or even increased. Grasslands can capture 50–80% more water than uncovered soil, well-managed inland water ecosystems like rivers and marshes can absorb and hold significant amounts of excessive water during extreme rain and flood events, and adequate reforestation of watersheds can lower stream flows during high precipitation cycles. In addition, water quality can be improved by ecosystems buffer strips and ground cover help to prevent siltation in creeks and rivers.

Ecosystems minimize the impacts of extreme weather events and climate variability – in a cost-effective way. Natural coastal ecosystems like corals reefs and salt marshes can reduce wave heights by 70%. Such ecosystem-based approaches are often not only more effective, they are also 2–5 times more cost effective than engineered structures.

EbA measures can provide co-benefits for local development, as well as mitigation of greenhouse gases. One example from the Gulf of Mexico showed how supporting the natural recruitment of oyster reefs not only reduced vegetation retreat by 40% and stabilized the shoreline of the Gulf of Mexico from erosion, it also increased the number and variety of marketable oysters, thereby ensuring a sustainable livelihood for the local population.

The simultaneous reduction of greenhouse gas concentration through natural carbon stocks can be achieved with EbA measures such as restoring wetlands or reforesting upstream catchments. Terrestrial ecosystems have the capacity to absorb up to 1/3 of climate change mitigation needs, while at the same time regulating water flows and reducing risks.

EbA measures pay off. The Upper Tana-Nairobi Water Fund, for instance, expects a USD 10 million investment in watershed conservation activities (including EbA measures such as restoration of riparian buffers and reforestation) to translate into USD 21.5 million in savings from wastewater treatment, amplified power generation and improved agricultural yields. The measures also simultaneously ensure water provision for downstream residents in Nairobi, despite the threat of climate change.

Including ecosystem-based approaches in water management plans can help leverage finance. Investments in green infrastructure in the water sector are rising as the recognition for their cost-effectiveness grows. The evolving ‘green bond’ market, for example, indicates potential for mobilizing green financing, and the investments of governments, water utilities and companies in nature-based ways to sustainably provide water are increasing at an annual rate of more than 11%.

EbA can improve “pandemic preparedness”. Because one of the main measures against the Covid-19 pandemic is regular hand-washing, the importance of water for hygiene and health has returned to the spotlight. Ecosystem-based measures can play a vital role in ensuring global water security in terms of availability and quality, thus laying an important foundation for countering health crises worldwide.

EbA measures	Environmental benefit	Risk reduction benefit	Socio-economic benefit
Green infrastructure (green roofs, porous pavements, parks) in urban areas and hinterland	Improved microclimate and habitat for urban species	Flood protection, reduction of extreme weather event risks	Risk reduction for people and infrastructure, new recreation areas, improved well-being, new employment opportunities
Landscape and watershed management, river basin management	Improved water provisioning and regulation, carbon sequestration, habitats	Flood protection, drought risk reduction	Improved water provisioning and quality, for consumption, sanitation and production sectors
Restoration of wetlands, artificial wetlands	Improved water provisioning and regulation, reduced carbon emissions and higher sequestration, habitats	Flood protection, drought risk reduction, storm buffering	Improved water provision and quality
Restoration of flood plains	Improved water regulation, erosion prevention, habitats	Flood protection	Risk reduction for people, infrastructure and industry, improved water provision and quality

Table 1: Typical ecosystem-based measures within the water sector (SCBD, 2019)

EBA IN PRACTICE IN THE WATER SECTOR: THE UPPER TANA-NAIROBI WATER FUND TRUST

The Tana River located in Eastern Africa is immensely important for Kenya. It provides **water for 9 million people** – including 4 million in the capital city of Nairobi – delivers **water to the 300,000 farmers** in a very important agricultural production area along the river, and generates **50% of Kenya's hydropower** output.

Changing rainfall patterns due to climate change threaten all of these uses of the Tana River. Reduced rainfall directly leads to less available water, yet extreme rainfall events also negatively affects water provision, as they wash away soil on the steep hills of the river's catchment area, destroying farmland and clogging water distribution and power generation facilities with sediment.

The Upper Tana-Nairobi Water Fund (UTNWF) was established as a public-private partnership, which brings together responsible politicians and water company leaders to ensure continuous water provision, including for residents of Nairobi downstream, in the face of challenges like climate change and unsustainable farming in the river catchment system.

The fund developed a business case and analysis, which found that a USD 10 million investment in water fund-led conservation interventions is likely to return USD 21.5 million in economic benefits within 30 years.

The predicted benefits include:

- improved water quality;
- a 15% increase in annual water yields during dry season;
- only half the amount of sediment in the river;
- an increase of over USD 600,000 in annual revenue for Kenya's electricity company due to increased power generation;
- savings of approximately USD 250,000 by the Nairobi City Water and Sewerage Company for avoided filtration costs.

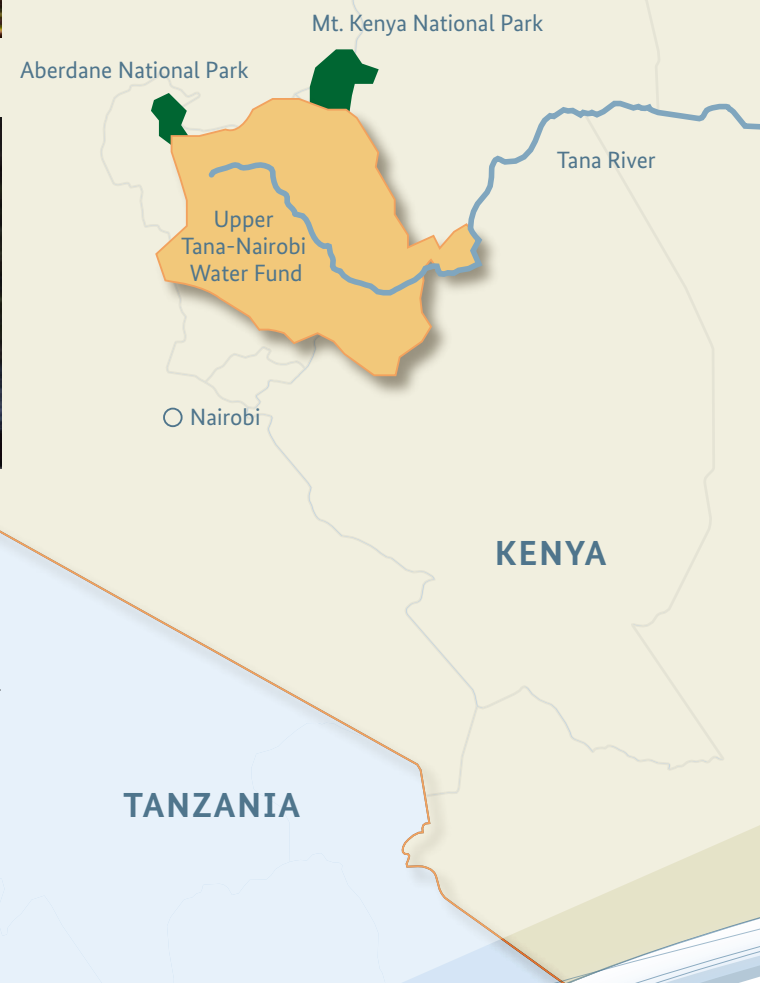


EbA measures such as reforestation help to ensure future water provision. © Bobby Neptune / The Nature Conservancy strategy



The use of nature and ecosystems can help to improve water availability and water quality. © Roshni Lodhia / The Nature Conservancy

A simulation model for the Tana River Basin system was established to investigate how best to ensure water provision: by changing the existing engineered infrastructure, constructing new dams and tunnels, or investing in natural infrastructure. The results showed that **the use of nature, ecosystems and biodiversity could very well ensure future water provision** and also provide **more than USD 170 million in co-benefits per year** through fisheries, flood recession agriculture, floodplain cattle grazing, etc. This would benefit mainly subsistence smallholder farmers and pastoralists in the river basin. Consequently, the fund invested in training and equipping farmers with everything they need to apply EbA measures such as vegetated buffer zones along riverbanks, terracing, agroforestry, reforestation, and water harvesting to ensure the provision of water for all uses and users.



Where to find more information

Publications

- Integrating EbA and IWRM for climate-resilient water management, [GIZ](#) (2021) – an exploration of how the two leading approaches in water resources management and ecosystem thinking for climate change adaptation (IWRM and EbA) can be merged to achieve greater climate resilience in watersheds.
- Stop Floating, Start Swimming: Water & Climate Change – Interlinkages & Prospects for future Action, [GIZ](#) (2020) – aims to improve understandings of the complex interrelations between climate change and water.
- Nature-based solutions for adapting to water-related climate risks, [OECD](#) (2020) – explores why prevailing decision making frameworks may fail to adequately consider NbS. Focusing on the application of NbS for addressing climate-related flood and drought risks, this paper sets out a policy evaluation framework that supports the identification of, and proposed ways to address constraints on the use of NbS to address water-related climate risks.
- Voluntary guidelines for the design and effective implementation of ecosystem-based approaches to climate change adaptation and disaster risk reduction and supplementary information, [SCBD](#) (2019) – provide detailed information on considerations for EbA and Eco-DRR, the respective principles and safeguards as well as implementation issues (including mainstreaming, awareness raising and capacity building). It also includes a part dedicated to [Outreach into Sectors](#), including water.
- The United Nations world water development report 2021: valuing water, [UNESCO](#) (2021) – assesses the current status of, and challenges to, the valuation of water across different sectors and perspectives, and identifies ways in which valuation can be promoted as a tool to help achieve sustainability.
- The United Nations World Water Development Report 2018: Nature-based Solutions for water, [UNWWDR](#) (2018) – demonstrates how NbS offer a vital means of moving beyond business-as-usual to address many of the world's water challenges while simultaneously delivering additional benefits vital to all aspects of sustainable development.

Initiatives and networks

- [Global Water Partnership](#) is a global action network that provides knowledge and builds capacity to improve water management at all levels: global, regional, national and local.
- The [Alliance for Water Stewardship](#), a global membership collaboration comprising businesses, NGOs and the public sector, contributes to the sustainability of local water resources through the members' adoption and promotion of a universal framework for the sustainable use of water.
- The [Women for Water Partnership](#) is a partnership of women's organizations and networks that uses water as an entry point to women's empowerment and to improve equitable access to water for all, for all uses.
- The [Alliance for Global Water Adaptation](#) is a member-driven global network to develop, crowd-source, and mainstream the emerging practice of climate resilience, especially with regard to water management.
- The [Water Integrity Network](#) focuses its work upon integrity and good governance to help realise the human rights to water and sanitation, boost sector performance, and ensure the sustainable use of water resources.



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