

→ Why working with nature pays off

The case for investing in Ecosystem-based Adaptation

If you are searching for sustainable and cost-efficient solutions to help you to adapt to climate change while also providing additional benefits, this brief offers you one clear option: Ecosystem-based Adaptation.

WE HAVE ALL COME TO LEARN ...

that climate change is striking harder and more rapidly than many expected. The period of 2011–2020 has been the warmest decade on record. Of all disasters occurring during that time, 83% were caused by extreme weather- and climate-related events, such as floods, storms and heat waves. The number of such events has risen by almost 35% since the 1990s. Extreme weather caused USD 2.5 trillion in economic losses worldwide in the last two decades and took the lives of more than 410,000 people in the last decade alone, the vast majority in low-income and lower-middle-income countries. Extreme weather has displaced 20 million people per year in the last ten years – this is equivalent to the entire population of Beijing having to flee their homes every year.

We have all seen the shocking figures. But a key part of the solution to many of these problems is evident – in fact, it is lying on our doorstep.



Ecosystem-based Adaptation (EbA)

Eba Criteria by FEBA (Based on CBD definition, 2009)

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**.



Nature across most of the globe has now been significantly altered by human activity: 75% of the land surface is significantly modified, 66% of the ocean area are experiencing impacts in the form of ecosystem decline, over 85% of wetland area has been lost, 32 million ha of forest in the tropics were lost (2010–2015) and one million species already face extinction. Achieving the Sustainable Development Goals (SDGs) will be nearly impossible if the current treatment of biodiversity and ecosystems persists. Their degradation undermines progress towards 35 of the 44 assessed SDG targets related to poverty, hunger, health, water, cities, climate, oceans and land. In 2020, the World Economic Forum called climate change a “planetary emergency”, for the first time in history ranking it (along with environmental issues such as biodiversity loss) as one of the top five global risks most likely to occur.



DID YOU KNOW ...

that solutions based on nature can help protect us from climate change impacts while slowing further global warming, supporting biodiversity, and securing ecosystem services? Indeed, they can! Science has given us sufficient proof that well-managed ecosystems can protect communities from impacts such as storm surges, flooding, erosion, water scarcity, and low agricultural productivity. Because ecosystems help provide additional benefits such as diverse sources of nutrition and income, they can lessen the degree to which peoples' livelihoods are affected by climate change – when other livelihood sources fail in the face of extreme events.

Ecosystems are already the basis for half the global gross domestic product and 1.2 billion jobs in sectors as farming, fisheries, forestry, and tourism. Ecosystem services worldwide are worth an estimated USD 125 trillion annually. About 1.6 billion people rely directly on the world's forests for food, income, and livelihoods. Restoring our forests could provide adaptation benefits for more than 25 million people, and protecting our coastal ecosystems could benefit more than 500 million people globally, bringing benefits of over USD 100 billion per year. Increasing the extent of these ecosystems through restoration would amplify these effects.

Not only will these measures help people adapt to climate change, they can also significantly contribute to mitigating climate change by storing carbon and taking CO₂ out of the atmosphere. Restoring and better managing our global ecosystems has the potential to meet about 1/3 of GHG reduction needs until 2030 and to enable us to reach the targets of the Paris Agreement. But only if we manage to shift away from fossil fuels.



OUR RELATIONSHIP WITH NATURE IS CRUCIAL IN ADAPTING TO CLIMATE CHANGE ...

This is why we need action inspired and supported by nature. Solutions that draw on the services humans derive from nature – i.e. biodiversity and ecosystems – are called Nature-based Solutions (NbS). The huge potential of NbS is now recognized by all the major international scientific bodies working on climate change and biodiversity. It is estimated that 90% of NbS support climate change adaptation.

Nature-based solutions for adaptation are also called Ecosystem-based Adaptation (EbA) – two terms, same meaning. EbA focuses on the protection of people, but this depends on healthy and well-managed ecosystems and biodiversity. Ecosystem conservation, restoration, and sustainable management are at its heart. EbA solutions exist for a broad range of climate change related problems, from increasing desertification to floods. They encompass solutions as diverse as ‘mangroves for coastal protection’ or ‘green roofs to improve urban climates’.

Already two out of three of the first national climate plans, i.e. Nationally Determined Contributions (NDC) to the Paris Agreement, feature EbA or NbS. Now we must put these plans into action.



Visit the Panorama platform to find more than 150 solutions for EbA.

PANORAMA PLATFORM



So, why does EbA pay off?

Nature-based solutions can contribute one third of the GHG mitigation needed to meet the 1.5°C target.

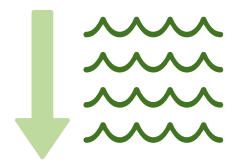
Long-term benefits of urban EbA and green-gray infrastructure usually outweigh initial investment costs by far.

EbA contributes to sustainable development, creating environmental, social and economic benefits.

EbA helps people to reduce climate-related risks that threaten their lives and livelihoods.

EbA measures help protect grey infrastructure and avoid costly damage, saving billions of dollars each year.

EbA contributes to “One Health”, creating benefits for human, animal and environmental health.



70%

reduction of
wave heights

EbA helps people to reduce climate-related risk that threaten their lives and livelihoods by protecting and restoring the ecosystems upon which we all depend. Intact coral reefs and coastal vegetation can scatter waves and protect shores from erosion. Mangroves alone protect 18 million people worldwide from coastal flooding every year. Forested mountains and slopes can stabilize soil, providing protection from erosion and landslides. Peatlands, marshes, and floodplains balance out floods and water scarcity, and natural coastal ecosystems like corals reefs and salt marshes protect coasts by reducing wave heights by 70%.

EbA avoids costly damage to assets and infrastructure, saving billions of dollars each year. The City of Portland, USA, saved USD 250 million in stormwater infrastructure costs by investing USD 8 million in green alleys and tree plantations, which absorbed water and prevented flooding. The cost of flood damage that mangroves avert totals roughly USD 80 billion per year. In Korea, decades of investment in afforestation has created jobs and yielded an estimated net present value of over USD 50 billion in 2010, thanks to a significant reduction of disaster risk and an increase in carbon sequestration.



2–5 times

more cost-effective
than grey infrastructure
measures

EbA often outperforms built infrastructure with respect to effectiveness and cost-efficiency. Comparisons between conventional ('grey') and 'green' infrastructure solutions show that EbA measures achieved a 10% higher reduction of flooding and a 7.5% higher reduction of peak flow. Their typically lower initial price, minor maintenance costs and longer lifetime make them the more cost-efficient alternative. In a comparison of 52 coastal defence projects in the US, for example, NbS were estimated to be 2–5 times more cost-effective than grey infrastructure measures. Additionally, while built infrastructure deteriorates slowly, many ecosystem measures grow denser, stronger, and thus more resilient over time. However, oftentimes there is no green alternative to built infrastructure or hybrid solutions, in which case a mix of green and grey infrastructure works best.







EbA investments save money over the long term. Future benefits by far outweigh the investment costs of ecosystem restoration. The benefit-cost ratio may be as high as 3 to 75 depending on the ecosystem. Each dollar invested in the restoration of ecosystems to regenerate farmland, for example, is estimated to yield USD 7 to USD 30 in benefits for every dollar invested. When combined with built infrastructure, EbA measures can serve to prolong their lifetime and reduce maintenance costs. The restoration of 12,000 ha of mangroves in Vietnam, for instance, reduced dyke maintenance costs by about USD 7.3 million/year, making this investment more than 6½ times worth its initial costs.

EbA measures come with numerous environmental, economic, and social (co-)benefits, many of which are often particularly important for Indigenous peoples, local communities and women who rely on natural resources. As much as USD 40–50 billion per year in benefits associated with fisheries, forestry, and recreation is provided by mangrove forests. As EbA measures are in part labour-intensive, they can contribute to job creation immediately and in the long term. In line with the EU 2020 Biodiversity Strategy, it is estimated that restoring 15% of the degraded ecosystems in the European Union would create 20,000 to 70,000 full-time jobs. Ecosystem-based measures are therefore no- or low-regret measures that bring co-benefits to local development, no matter what the exact scale of climate change impact may be.

EbA implementation also provides benefits for climate change mitigation through the reduction or sequestration of greenhouse gases. Terrestrial ecosystems currently absorb about 20% of greenhouse gas emissions by human activities and have the potential to contribute more than 1/3 of climate change mitigation needs. Combining both adaptation and mitigation, as in the restoration of wetlands to absorb extreme rainfall events and store greenhouse gases, can therefore address two of the most pressing global challenges with the same action.

EbA helps communities to cope with the COVID-19 pandemic and support “building back better”. The pandemic highlights the critical connections between human and ecosystem health. In fact, the same human activities that drive climate change and biodiversity loss also drive pandemic risk through their impacts on our environment. Ecosystem restoration, which is at the heart of EbA, can help humanity to become more resilient. It can provide green jobs and economic recovery to communities in the short term, and over the long term restoration can lower the vulnerability of ecosystems and communities, increasing their health, livelihoods, and well-being. In coastal Honduras, for instance, community-led ‘no-take’ marine reserves are helping to replenish fish stocks and thus provide alternative sources of livelihood and nutrition in the face of climate change and other shocks. During the pandemic, when supply chains were disrupted, small-scale fisheries have become a critical safety net for thousands of Honduran coastal families who depend on them for daily sustenance.



Hazard	Ecosystem-based Adaptation	Potential additional benefits
 <p>Coastal hazards</p> <ul style="list-style-type: none"> • Sea level rise • Storm surge • Coastal erosion 	<ul style="list-style-type: none"> → Mangrove protection and restoration to anchor sediments and dissipate wave energy → Management and restoration of coastal marshes and/or dunes to dissipate wave energy and/or complement engineered protection → Coral reef management and restoration to attenuate wave energy 	<ul style="list-style-type: none"> → Improved fish stocks → Biodiversity conservation → Carbon sequestration and storage → Sediment accretion → Tourism and recreation and associated employment
 <p>Intense precipitation</p> <ul style="list-style-type: none"> • Flood • Soil erosion • Landslide 	<ul style="list-style-type: none"> → Management and restoration of watershed vegetation to enhance infiltration, reduce run-off and peak flows, and stabilize slopes → Agroforestry to enhance canopy interception of rainfall and rainwater infiltration and reduce soil exposure, thereby reducing run-off and erosion → Urban watercourse restoration, and ‘re-naturing’ to reduce assets at risk and secure riverbanks → Maintenance and restoration of urban greenspaces to improve rainwater infiltration and reduce run-off → Management and restoration of wetlands to store floodwater or slow its release and filter sediments 	<ul style="list-style-type: none"> → Increased availability of wild-sourced food and other products → Pollination services → Carbon sequestration and storage → Improved soil fertility → Biodiversity conservation → Improved water quality → Improved physical and mental health among urban populations
 <p>Drought</p>	<ul style="list-style-type: none"> → Management and restoration of watershed vegetation to enhance infiltration, recharge groundwater stores and maintain surface water flows → Establishment of ‘Green Belts’ to increase water availability, improve soil quality, provide shade and windbreaks 	<ul style="list-style-type: none"> → Increased availability of wild-sourced food and other products → Pollination services → Carbon sequestration and storage → Improved soil fertility → Biodiversity conservation
 <p>Rising temperatures</p> <ul style="list-style-type: none"> • Heat stress • Urban heat islands • Wildfire 	<ul style="list-style-type: none"> → Agroforestry to enhance canopy cover and provide shade → Rehabilitation and restoration of rangelands to repair ecological processes and enhance fire resistance → Creation of urban green spaces to increase vegetative canopies, which provide shade and evaporative cooling 	<ul style="list-style-type: none"> → Carbon sequestration and storage → Improved soil fertility → Biodiversity conservation → Improved physical and mental health among urban populations

A LOOK AT ONE EXAMPLE OF SUCCESSFUL EBA

Peru's Nor Yauyos Cochas Landscape Reserve (NYCLR), located in the high-mountain Andean ecosystem, is characterized by montane grasslands and wetlands. This region is especially vulnerable to climate change as global warming melts glaciers, whose partial melting processes in summer have been a stable source of water for surrounding Andean communities. Now, their increased melting causes flooding and, once the glacier is melted, droughts. Another problem in mountainous areas are heavy rains, which can easily erode steep slopes and cause landslides, destroying houses and agricultural land.

To counter these threats and ensure the livelihoods of the local population, which depends on the mountain ecosystem for live-stock farming and subsistence agriculture, a [Mountain EbA project](#) was created by the Ministry of Environment of Peru, the National Service for Natural Protected Areas and the reserve authority together with the support of international organizations. Activities included capacity building, institutional strengthening, and community organization regarding pasture, water, and livestock management, as well as concrete EbA measures implemented in communities located in the reserve.

Micro-watersheds and wetlands were supported by restoring water channels and reservoirs to ensure fresh water for the habitants of the reservoir as well as for downstream users. This, combined with grassland management measures that stabilize the soil, store nutrients, and regulate water and humidify 800 hectares of natural pasture, can increase resilience to drought and frost and even protect the area from nearby [wildfires](#). Another positive effect is [increased carbon storage](#), which contributes to climate change mitigation.

On a local scale, the quality of pasture could be improved immensely. Whereas one hectare of pasture used to provide enough fodder for only half a sheep, it can now feed 18 sheep; this has helped to secure and improve pastoral livelihoods and local food security. Additionally, improved management of the locally adapted vicuña, a close relative of llamas and alpacas, provides local people with more of its fine, valuable wool.

Local residents evaluated the project positively, and economic analysis proved that the benefits created by EbA measures outweighed their costs. The benefit-to-cost ratio was always above two, indicating that the benefits are [twice as high](#) as implementation costs. Compared to business-as-usual scenarios, net present values were [3 times as high](#). These advantages, combined with social improvements such as an observed increase in participation, have led to the inclusion of EbA into local-level management plans, a [Regional Climate Change Strategy](#), and the [National Policy Guidelines for Public Investment in Biodiversity and Ecosystem Services 2015–2021](#).



Protection of mountain ecosystems can stabilize water availability and increase resilience to extreme events. © Rafael Iriarte / Sernanp



Improved management of the locally adapted vicuña secures local livelihoods. © Carlos Díaz Huertas / EbA Montaña / Sernanp



Where to find more information

Publications

- The Voluntary guidelines for the design and effective implementation of ecosystem-based approaches, issued by Secretariat of the Convention on Biological Diversity (CBD), [UNEP and GIZ](#) (2019) suggest a flexible framework for planning and implementing EbA and Disaster Risk Reduction initiatives.
- [Nature-based Solutions to Climate Change – Key messages for decision makers in 2021 and beyond](#), puts forward a set of guidelines designed to inform the planning, implementation, and evaluation of NbS initiatives.
- Making EbA effective – a framework for defining qualification criteria and quality standards (ENG, ESP, FR) is a Technical Paper by [GIZ, IUCN, and IIED](#) (2018) in the framework of the Friends of EbA network that provides a practical assessment framework for designing, implementing and monitoring EbA measures by proposing a set of 3 elements, 5 qualification criteria and 20 quality standards with example indicators.
- In its fifth edition, the Adaptation Gap Report 2020 by [UNEP, the UNEP DTU Partnership, and the World Adaptation Science Programme](#) (WASP) takes a look at the broader picture with regards to progress in planning for, financing and implementing adaptation – with a focus on NbS.
- The United Nations Office for Disaster Risk Reduction ([UNDRR](#)), in its report on Ecosystem-Based Disaster Risk Reduction: Implementing Nature-based Solutions for Resilience (2020), gives practical, how-to information on setting up and implementing NbS, especially for DRR that integrates adaptation to climate change.
- The Adapt now: a global call for leadership on climate resilience (2019) report by the [Global Center on Adaptation](#) focuses on making the case for climate adaptation, providing specific insights and recommendations in key sectors: food security, the natural environment, water, cities and urban areas, infrastructure, disaster risk management, and finance.
- Building Resilience With Nature – Maximizing ecosystem-based adaptation through National Adaptation Plan processes (2021) is a guidance note developed by the [National Adaptation Plan \(NAP\) Global Network](#). Network members identified the need to better understand and identify concrete entry points and opportunities to strengthen the integration of EbA into adaptation planning. The guidance note presents “why” and “how” the NAP process can be used as a key mechanism and driver to mainstream and upscale EbA.

Initiatives and networks

- The [International EbA Community of Practice](#), convened by GIZ, engages researchers and practitioners in knowledge sharing and mutual learning on ecosystem-based approaches beyond projects, institutions and regional boundaries. Publications by GIZ’s Global Project on Mainstreaming EbA can be founded [here](#).
- [Friends of EbA \(FEBA\)](#) is a global collaborative network of 80+ agencies and organizations involved in the research and practice of EbA, working jointly to share experiences and knowledge, improve the implementation of activities on the ground, and to have a stronger and more strategic learning and policy influence on EbA.
- The platform [PANORAMA Solutions for a Healthy Planet](#) is a partnership initiative to document and promote examples of inspiring, replicable solutions across a range of conservation and sustainable development topics, enabling cross-sectoral learning and inspiration. EbA features as one of the pillars of this knowledge platform.
- The [Nature-based Solutions Evidence Platform](#) of the Nature-based Solutions Initiative of the University of Oxford is an interactive map linking NbS to climate change adaptation outcomes based on a systematic review of the peer-reviewed literature.



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