UN environment programme

Insights on **Ecosystem-based Adaptation** Stories from Latin America and the Caribbean

REGATTA
Portal Regional para la Transferencia de Tecnología y la Acción frente al Cambio Climático en América Latina y el Caribe

cooperación española

Practical ACTION

A publication of the EbA Community

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Abbreviations

EbA	Ecosystem-based Adaptation
PA	Protected Areas
CBD	Convention for Biological Diversity
UN Climate Change	United Nations Framework Convention for Climate Change
IPCC	Intergovernmental Panel on Climate Change
MEA	Millenium Ecosystem Assessment
SDG	Sustainable Development Goals
NAP	National Adaptation Plans
SSP	Silvopastoral Systems

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Introduction

Background

Climate change and environmental degradation have resulted in irreversible impacts on socio-ecological systems (IPCC, 2018). **The world must brace for more extreme weather and irreversible impacts affecting the natural and human systems unless unprecedented changes in all aspects of society are keeping global warming to a 1.5-degree pathway**. That is the clear message from the recently released IPCC's 1.5C Special Report. Certainly, low-lying areas, fragile ecosystems and oceans especially, will be affected even under 1.5-degree track. Impacts will hit the populations especially in the global South, resulting in population displacement, health effects and more.

Ecosystems provide a wide range of services and goods, which support the basis for livelihoods and human well-being. Ecosystem functions and processes (e.g. soil formation) underpin the provision of ecosystem services (e.g. crop production), which in turn provide goods that people value (e.g. food and water). However, environmental and human-induced disruption of ecosystem functions (e.g. functioning of hydrological cycle contributing to flood control and drinking water supply) exacerbates the vulnerability of socio-ecological systems (MEA, 2005).

Although all adaptation efforts take place in very specific contexts, case studies can highlight common social, policy and institutional conditions that maximise the uptake of EbA. At the local level, this evidence can help build capacity and assist people to implement transformational adaptation on the ground. At a national level, it may encourage the integration of these approaches into the wider policy planning and help increase funding for EbA programmes and initiatives through sectoral budget revisions. EbA can be mainstreamed into national government processes and policy measures within climate and development planning. Other opportunities for scaling up EbA can be found in mainstreaming, replication and diversification within other sectors such as oceans strategies, national development frameworks and fisheries policy, as well as within development and humanitarian organisations, the private sector and at the level of multilateral financing institutions.

At an international level, EbA is recognized as instrument for promoting synergistic implementation of the Rio Conventions – the Convention on Biological Diversity (CBD), the UN Convention to Combat Desertification (UNCCD), and the UN Framework Convention on Climate Change (UN Climate Change).

EbA Community of Practice for Latin America and the Caribbean

South-South cooperation has a catalytic potential to address climate change by improving collaboration, knowledge generation and exchange. It further enables the transfer of technology to support effective adaptation practices. Developing countries depend to a large extent on the ecosystems and the services they provide.

Ecosystem-based Adaptation (EbA) is emerging as a key approach to climate change and a fundamental pillar for sustainable development.

UN Environment under the Regional Gateway for Technology Transfer and Climate Change Action in Latin America and the Caribbean (REGATTA) recognises the need for collective learning on EbA. Together with the support of the Government of Spain, and in collaboration with Practical Action - Regional Office for Latin America, UN Environment established the bilingual knowledge platform and the EbA Community of Practice for Latin America and the Caribbean (www.ebacommunity.com).

The EbA Community of Practice was launched in critical years for the climate negotiations (2014-2015), so it took advantage of a crucial moment to develop a South-South collaboration network in promoting the inclusion and visibility of the EbA approach.

This interaction at a regional scale improves learning opportunities for the development, transfer and diffusion of knowledge and technology. Moreover, it is a crucial factor in resilience building and strengthening of adaptation capacities in Latin America and the Caribbean.

The EbA Community of Practice launched a regional contest entitled "Demonstration of evidence on Ecosystem-based Adaptation: Case studies in Latin America and the Caribbean", based on a defined evaluation criteria and eligibility requirements. The purpose of the contest was to identify cases of EbA, which contribute to the resilience and adaptation of communities and ecosystems to climate change. Ten case studies from across the region were selected to share evidence of the effectiveness of EbA measures in improving climate resilience of human livelihoods. The case studies further highlight the challenges and lessons learned from these experiences.

Purpose and scope

The objective of this summary report is to

highlight the lessons learned from the field implementation of ten case studies presented at the regional contest.

It analyses the case studies and identifies the opportunities and barriers for strengthening EbA in the region. This is a summary highlighting the key insights from the implementation of EbA in eight countries. It is based on the technical report "Demonstrating evidence on Ecosystem-based Adaptation in Latin America and the Caribbean: Ten case studies", which presents the complete profile of each of the case studies.

Photo: Project archive

A snapshot of the EbA case studies

The projects analyzed included a great diversity of **geographical contexts and topics**. Projects in coastal marine contexts focused on coral restoration (Grenada), coastal restoration through mangrove planting (Mexico) and dune regeneration (Uruguay). Projects in the valley and mountain ecosystem contexts focused on silvopastoral systems (Mesoamerica) and restoration of wetlands (Cuba and Peru), while other projects focused on agroecological solutions. Capacity building and participatory approaches were the central axis of most projects, especially in Grenada and Brazil.

A common feature to the development of the projects was the interaction with **diverse stakeholders**: producers; community leaders; non-governmental organizations; cooperatives; governmental actors (local and national decision-makers); research institutions; and actors from the private sector.

Several projects highlighted the importance of the capacities of **government institutions**, at the various state levels (local, sub-national and national). Institutions and public policies play a key role in terms of climate change and climate compatible development and thus for the effective implementation of EbA solutions.

Finally, the areas in which greater knowledge is needed were identified in the projects included in this compilation. Such knowledge gaps included: effectiveness of EbA practices; strategies to strengthen resilience and increase food security; gender approaches to improve understanding of the causes of vulnerability and the context of inequity, the role of capacity building in mainstreaming EbA, monitoring and evaluation, among others. Table 1 presents a list of the case studies and their characteristics.

Tab. 1. Basic descriptive elements of the EbA case studies in Latin America and the Caribbean.

#	Project name	Country	Ecosystem	Climate risk	EbA measures
1	The promotion of adaptation to climate change in the Ciénaga de Majaguillar wetland and the coastal area of the Martí Municipality in the Matanzas Province	Cuba	Coast Wetlands	Thunderstorms and hurricanes	Wetland restoration
2	EbA for silvopastoral systems: sustainable livestock practices at a landscape scale adapted to climate change	Meso-America	Coastal savannas Pine forests	Prolonged drought Increase in climate variability	Silvopastoral systems
3	Silvopastoral systems: A technology for the development of sustainable livestock adapted to climate change	México, Honduras Nicaragua, Costa Rica and Panama	Coastal savanas Pine forest	Increased temperature Increased number of flood events Soil erosion Biodiversity loss	Silvopastoral systems
4	Building the case for Ecosystem Based Adaptation in Small Island Developing States	Grenada	Coral reefs	Increase in sea level rise Salinization of coastal land Beach erosion	Restoration of coral reefs and local capacity building

#	Project name	Country	Ecosystem	Climate risk	EbA measures
5	Adaptation to climate change via the restoration and conservation of coastal ecosystems in the South Atlantic	Uruguay	Coastal dunes	Beach erosion Increase in sea level rise	Installation of dune regeneration catchment fence, revegetation of the coastal forest, awareness raising
6	Robust measures of Ecosystem-based Adaptation in Canchayllo and Miraflores in the Nor Yauyos Cochas Landscape Reserve	Peru	Mountain and puna	Variations in seasonal patterns of rainfall Water scarcity	Expansion and conservation of wetlands Communal management of native grasslands
7	Ecosystem-based Adaptation for the Indigenous Territory of Bribri	Costa Rica	Tropical forest	Increase in frequency and intensity of rainfall, change in rainfall seasonality	Agroecology based on indigenous knowledge
8	Adaptation in coastal wetlands of the Gulf of Mexico to the impacts of climate change	Mexico	Coastal and marine	Changes in rainfall patterns, water scarcity, coastal erosion and sea level rise	Mangrove restoration Riparian reforestation

Figure 1. Map highlighting the countries where the EbA case studies described in this work were implemented.

The eight case studies in this report were assembled and summarized to provide insights on the role of EbA solutions to address climate risks in Latin America and the Caribbean region. They are organized around six main topics.

1

EbA solutions are an **effective approach to address climate risks**

2

EbA solutions build **resilient and productive landscapes**

3

EbA governance fosters **equitable multi-stakeholder collective action**

4

Capacity building as an enabling condition for EbA mainstreaming

5

EbA embraces **indigenous and local knowledge systems**

6

EbA solutions are a **vital part of national and sub-national adaptation strategies**

Photo: Practical Action

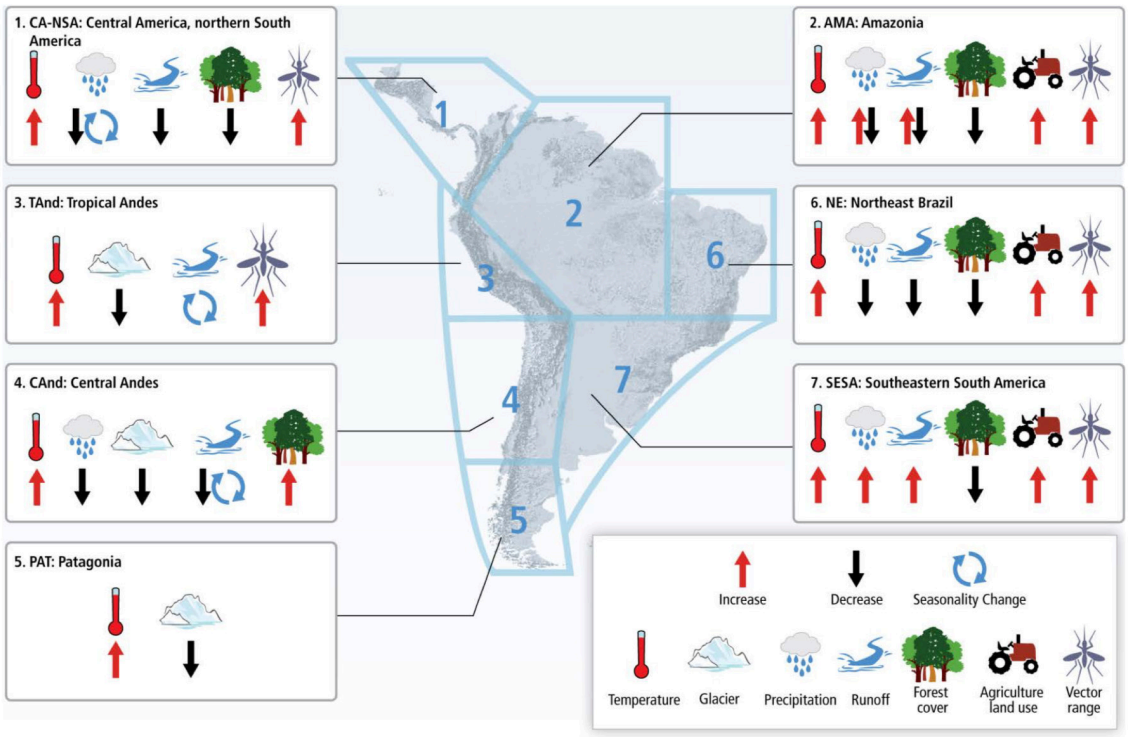
Background

Climate change and vulnerability in Latin America and the Caribbean

Climate change has already manifested in many of the countries from Latin America and the Caribbean. Based on data collected since 1950, evidence suggests that climate change has changed the magnitude and frequency of some extreme weather and climate events in the region (CDKN, 2014). According to the IPCC AR5 during the last decades of the 20th century, the increased occurrence of high temperatures, intensified rainfall events and unusual extreme weather events have been severely affecting the region contributing greatly to increasing the vulnerability of human systems to natural disasters (Magrin et al. 2014).

Climate projections shows that changing climate will lead to even stronger changes in the frequency, intensity, spatial extent or duration of climate extremes, and can result in unprecedented extremes in Latin America and the Caribbean (Magrin et al. 2014). Figure 2 presents a snapshot of the

Figure 2. Overview of climate change and vulnerability in Latin America and the Caribbean Region (Magrin et al. 2014).



projected climate change for the countries of Latin America referring to predominant increase in temperature and decrease in rainfall in most of the regions. In the face of such climate threats, the countries in the region require urgent adaptation solutions to decrease the vulnerability of populations and ecosystems alike.

Ecosystem-based adaptation: definition and principles

Healthy ecosystems provide goods and services that are critical for reducing climate vulnerability and risks, while enhancing community resilience.

However, the potential climate impacts on ecosystems could compromise the provision of ecosystem services and thus directly affect human populations depending on them. Therefore,

ecosystem management should have a central role in climate change adaptation and disaster risk reduction strategies.

Conservation, sustainable management and restoration of ecosystems can help people to effectively adapt to the detrimental effects of climate change.

Photo: Project archive

Ecosystem-based Adaptation (EbA) is defined as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change" (CBD, 2019). EbA has been receiving increasing attention for it has a great potential to reduce the vulnerability of both people and ecosystems to climate change impacts. Also, the approach strengthens the provision of ecosystem services that provide additional multiple social and economic benefits such as clean water, food security, and other services essential for livelihoods and human-well-being (TEEB, 2010).

Case studies and literature indicate that EbA can be flexible, cost-effective and broadly applicable approaches for reducing the impacts of climate change (Munang et al. 2013).

EbA solutions include coastal habitat restoration, agroforestry, integrated water resource management, livelihood diversification, and sustainable forest management interventions that use nature to reduce vulnerability to climate change. Examples of concrete EbA solutions include (UN Climate Change, 2013):

- Conservation, sustainable management and/or restoration of mangrove forests to reduce the impact of coastal flooding and erosion from storm surges linked to changing frequency and intensity of storms;
- Sustainable management of upland wetlands, forests, and floodplains for the regulation of water flow and control of water quality;
- Conservation and restoration of forests to stabilize land slopes and regulate water flows;
- Establishment of diverse agroforestry systems to cope with increased risk from changes in climate conditions;
- Management of ecosystems to complement, protect and extend the longevity of investments in hard infrastructure;
- Conservation of agrobiodiversity to provide essential gene pools and facilitate crop and livestock adaptation to climate change;
- Establishment and efficient management of systems to ensure the continued delivery of ecosystem services to support resilience to climate change, for example through protected areas, land use and agricultural systems.

The growing experience with EbA initiatives worldwide has provided evidence of the effectiveness of this approach. **Five criteria can be highlighted to ensure that EbA measures are effective** (FEBA, 2017). EbA solutions should:

1. Reduce social and environmental vulnerability to climate change.
2. Generate social benefits and support the most vulnerable.
3. Restore, maintain or improve ecosystems and biodiversity.
4. Feed into existing development policies at multiple levels.
5. Support equitable governance and improve capabilities.

Insights on the role of EbA in resilience building

This compilation of case studies presents a range of lessons learned underpinning the role of EbA in national actions for adaptation: the understanding of the socio-ecological aspects of vulnerability for the design of the EbA projects, the role of landscape approach for EbA management and the need for multi-level governance and capacity building as an enabling factor for EbA implementation.

Insight 1:
EbA solutions are an effective approach to address climate risks

Adaptation solutions should be designed based on best available climate information, assessment of climate risks and vulnerability of populations and ecosystems. Adopting a systems approach for analysing the climate risk and vulnerability of social-ecological systems is key for the design and prioritization of EbA solutions. Such an approach allows for the understanding of the role of ecosystem services in reducing exposure to climate risks and human vulnerability. It also allows defining measures for reducing the vulnerability of both ecosystems and societies. EbA solutions are often referred to as low-regrets or no-regrets options as they can generate benefits regardless of uncertainties in climate projections.

An example from Uruguay presents the potential for EbA solutions to reduce impacts from sea level rise and coastal erosion. These EbA solutions are designed based on comprehensive climate risks assessment and therefore demonstrate the effectiveness of the approach even in short timeframes.

EbA solutions restore, maintain or improve ecosystems and biodiversity to reduce social and environmental vulnerability to climate change.

Case study: Uruguay
Adaptation to climate change via the restoration and conservation of coastal ecosystems in the South Atlantic in Uruguay

Photo: Works of reprofiling canyons. Rain damping. Project archive

Climate risk: Coastal erosion, sea level rise

Ecosystem: Coastal ecosystem

Location: The project was implemented in a coastal ecosystem characterised by alternating landscapes of vast prairie areas, river deltas and streams, bathing areas (some of global importance are part of the RAMSAR sites in Uruguay) dune fields and coastal cliffs.

This coastal area is a geological formation of greater vulnerability to erosion processes, which represent areas especially sensitive to extreme events and the increase in mean sea level associated with climate change.

EbA solution: The implemented EbA solutions include the installation of dune regeneration catchment fence, revegetation of the coastal forest, awareness raising. This project developed an alternative for coastal management based on an ecosystem and community approach to increase the resilience to climate change where citizen participation and economic viability are contemplated for its sustainability over time.

Lessons learned

1. Obtaining and showing results in the short term is very important to maintain the motivation of the community and the decisive factors on the EbA approach. In the case of this project this was possible through concrete EbA measures such as enhancement of the coastal sand dunes, which protected local infrastructure from the impacts of waves.
2. Monitoring is crucial not only for the management of the EbA project, but also it provides concrete information on the evolution of the measures and keeps interested parties informed.
3. The adaptation measures implemented, with their components of analysis, training and social participation, were valued by the team, municipalities and local actors, for their results in the short time (less than 6 months).
4. The importance of the vision of all measures as a whole that must be implemented simultaneously to achieve greater positive effects in less time.

Photo: Project archive

Insight 2:
EbA solutions build resilient and productive landscapes

Ecological and social systems and processes operate at different scales. The scale of key ecological functions and processes is at landscape level (MA, 2005). The flows of water, nutrients, sediments, the habitats of animals and plants often operate beyond farm or municipal level but rather embrace a landscape. Many of these ecosystem flows are critical to human livelihoods, providing ecosystem services such as water for consumption and irrigation, food security and mitigation of flood risk.

Administrative scales often operate at smaller units such as villages and district level, while landscape scale provides an arena for collaboration and multi-stakeholder initiatives, which are needed for effective adaptation initiatives (Milder et al. 2012).

In particular, productive landscapes are multifunctional and provide different goods and services to different stakeholders. A critical aspect of the ecosystem-based approach is that it can be applied to diverse ecosystems and geographical scales – local, national, regional and global (Devisscher, T., 2010). Thus, due to its multi-sectoral and multi-scale characteristics, it can integrate a variety of disciplines, stakeholders, and institutions, so that they can work at a range of governance levels and can influence decision-making (Vignola et al., 2009).

Therefore, adopting an EbA approach contributes to strengthening the resilience of these landscapes, generates multiple adaptation benefits and supports the integration of social, economic and environmental objectives (FAO, 2014). Experiences from Cuba and Mesoamerica demonstrate that EbA promotes aspects to facilitate the adoption of a landscape approach. It considers all land uses and the opportunity to connect actors and sectors in the landscapes.

Case study: Cuba
The promotion of adaptation to climate change in the Ciénaga de Majaguillar wetland and the coastal area of the Martí municipality in the Matanzas province

Climate risk: Prolonged drought, shift in seasonal rainfall

Ecosystem: Wetlands and coastal ecosystem

Location: The project was implemented in Matanzas Province, Martí municipality. The municipality is located on the north coast of the country and the province.

Agriculture is one of the main economic activities in the region with main crops sugarcane, rice and various stable crops.

EbA solution: The implemented EbA measures include:

1. Agricultural conservation practices: production and application of organic fertilisers; compost production; levelling the soil to improve the efficiency of the irrigation; production of drought-resilient seeds for grass and forage cultivars.
2. Water resource management: restoration and construction of reservoirs; rainwater harvesting.
3. Improvement of the forest cover of the wetland through reforestation and establishment of silvopastoral systems.

Lessons learned:

1. The environmental land-use management approach is important to design the EbA measures aligned with economic development priorities at a landscape scale. In the land-use planning approach it is crucial to consider climate change aspects and the state of the environment as a system in order to design effective EbA measures.
2. Engagement with diverse local and national stakeholders is key to develop these interventions; and workshops can serve as a tool to strengthen the risk perception, vulnerability analysis, and co-design of EbA measures at a landscape scale.

Photo: Project archive

Case study: Mesoamerica

Silvopastoral systems: A technology for the development of sustainable livestock adapted to climate change

Climate risks: Prolonged drought, increase in climate variability

Ecosystems: Coastal savannas, pine forests

Location: The project was implemented in Mexico, Honduras, Nicaragua, Costa Rica and Panama, which form part of the Mesoamerican region. The Mesoamerican region is one of the most highly vulnerable areas to climate hazards such as hurricanes, tropical storms, floods, droughts, landslides and earthquakes. A large area in the region is destined for extensive livestock farming, which is considered one of the main reasons for land and forest degradation.

EbA solution: The objective of the project was to enhance the resilience of pasture systems and thus to cattle to prolonged drought through ecosystem restoration practices. The EbA solutions include the implementation of silvopastoral systems with different designs, spatial arrangements and tree species according to the characteristics of the region and with high adaptation potential.

Specific practices include:

1. Reforestation with multi-purpose trees and shrubs forming part of natural fences.
2. Restoration of degraded pastures to adjust to the drought-induced impacts of climate change.

Lessons learned

1. The restoration with EbA approach at a landscape level such as degraded livestock pastures, through the recovery of vegetation and biodiversity, has provided important co-benefits such as enabling biological connectivity and allowing a more favorable habitat for the transit and dwelling of diverse animal species, thus generating local, regional and global biodiversity benefits.
2. Taking a landscape approach fostered an alliance among the public and private sectors to establish a pilot initiative on Payments for Environmental Services (PES) that involve the implementation of silvopastoral systems and the conservation of forests as environmental safeguards.

Insight 3:
EbA governance fosters equitable multi-stakeholder collective action

With climate change being recognised as a global issue, diverse forms of natural resources governance are increasingly driven by state and local level actors. **Strengthening governance for adaptation requires that institutions, policies and legislation must respond to the challenges of improving resilience**. Good governance is at forefront in natural resource management and development discourse (McDougallet al. 2004). It accounts for the sustainable management of resources and livelihoods. The key features in good governance are effectiveness, responsiveness, accountability, participatory, predictability, transparency and equitability.

These new, emerging forms of governance – within and beyond the different levels of the government - provide new entry points for EbA mainstreaming in development and adaptation processes and strategies (GIZ, 2019). In particular, local actors (e.g. municipalities, local businesses, individual landowners, communities, and indigenous associations) play a leading role in promoting and implementing EbA measures. They usually have excellent knowledge about the factors that shape the climate risk and vulnerability of the local population and ecosystems. The strong consideration of local actors in EbA governance has the potential to initiate bottom-up mainstreaming processes for EbA and ensure sustainability of the EbA solutions.

EbA solutions require good governance for equitable multi-stakeholder processes and local ownership.

Governance of EbA refers to the norms, institutions and processes that determine how a society exercises power, distributes responsibilities and makes decisions to protect, sustainably manage and restore ecosystems, as part of an overall strategy to adjust to actual and expected climate and its effects (Iza, 2019). The mainstreaming of EbA in development planning requires the consideration of effective governance aspects such as multi-sector and multi-stakeholder engagement.

Given that EbA solutions underpin the functions of diverse sectors and provide benefits to different social groups at various levels, adopting a multi-stakeholder approach is the core for effective governance and sustainability. Experiences from Peru and Mexico demonstrate that EbA provides a platform for engaging with multiple actors and promotes effective governance for adaptation.

Case study: Peru
Robust measures of EbA in Canchayllo and Miraflores in the Nor Yauyos-Cochas Landscape Reserve

Climate risk: Variations in seasonal patterns of rainfall, water scarcity

Ecosystem: Mountain ecosystem

Location: The project was developed in the Nor Yauyos-Cochas Landscape Reserve, located in the central Andean region of Peru; specifically, in the communities of Canchayllo and Miraflores. The main objective of the Reserve is the conservation of important watersheds for water regulation and hydroelectric energy production. The Campesino Community of Canchayllo has an area of 7650 hectares between 3600 and 5700 meters above sea level. The Campesino Community of Miraflores has an area of 13,031 hectares between 3000 and 5400 meters above sea level.

EbA solution: The project seeks to strengthen the institutionality and community organization for the management of pastures, water and livestock through EbA robust measures*. The project aimed at improvement of the distribution of water through the following EbA solutions:

1. Rehabilitation and conservation of wetlands.
2. Community-based management of native grasslands.
3. Restoration of ancestral and contemporary technologies for the water management in the puna ecosystem.

These solutions were enhanced by the strengthening of community organization for the management of resources and newly formed committees for the maintenance of the green infrastructure.

Photo: Community work in Miraflores. Project archive

Lessons learned:

1. The project implementation strategy, based on permanent consultation and engagement of the local population and the local formal levels of governance, has printed a sense of ownership and co- authorship of the project.
2. It is important to work in a coordinated manner from the beginning with the various actors and partners of the initiatives, establishing good governance for implementation.
3. Finding the commitment and support of local authorities/ leaders and involving them in the key decision processes and also fostering alliances with local governments will help to make the measure sustainable.

* "Measures that do not worsen vulnerability to climate change or that increase adaptive capacity, and that will always have a positive impact on livelihoods and ecosystems, regardless of how the climate changes".

Photo: Infrastructure improvement in Canchayllo. Project archive

Case study: Mexico
Adaptation of coastal wetlands of the Gulf of Mexico to the impacts of climate change

Climate risk: Changes in rainfall patterns, water scarcity, coastal erosion and sea level rise

Ecosystem: Coastal wetland and marine ecosystem

Location: The project was implemented in three coastal wetlands of the Gulf of Mexico, including mangrove areas at:

1. Papaloapan River - Alvarado Lagoon: municipalities of Alvarado and Tlacotalpan, State of Veracruz.
2. Carmen-Pajonal Machona Lagoon System: municipality of Cardenas, State of Tabasco.
3. Wetland Punta Allen and coral reef: Biosphere Reserve Sian Ka'an, State of Quintana Roo.

EbA solution: The project had a strong participatory approach with focus on gender transformative actions. The implemented EbA measures include:

1. Mangrove restoration of 25 ha with black, white and red mangrove species.
2. Riparian reforestation: In the riparian reforestation 3,343 plants of 35 native species were used (fruit trees, woody, timber).
3. Conservation and sustainable use of mangroves: Specification of restoration, recovery and zones for use, providing economic value to the mangrove and promoting its conservation.
4. Territorial Ecological Planning with a focus on climate change.

Lessons learned:

1. Involving and achieving ownership of the project in communities with a weak social structure and limited organization is essential for the effective implementation of the EbA measures and their sustainability.
2. The EbA measures require the collaboration between multidisciplinary teams, including specialists in social engagement and focus on human rights and gender, who are constantly working in the field beyond the duration of the project.
3. The engagement of local decision makers from the beginning of a project is essential to have a broad picture of the social, political, environmental, economic and security situation and local priorities.
4. The successful engagement with local government institutions depends on the establishment of effective channels of communication and coordination among the participating agencies to keep them informed and report the progress of the project.

Photo: Project archive

Insight 4:
Capacity building as an enabling condition for EbA mainstreaming

Capacity building is recognised as an underpinning enabling condition for effective implementation of adaptation actions and good governance, which is an important condition for EbA solutions. Governments, development agencies, and the private sector need to collaborate to strengthen knowledge and capacity for managing climate risks by developing a concerted capacity-building, particularly at the local level (Global Commission of Adaptation, 2019). Capacity development also strengthens inclusive ownership, necessary for ensuring local engagement and sustainability of EbA results in a long run.

For successful capacity building on EbA, it is important to define the relevant stakeholders and tailor the adaptation strategies context-specific conditions and issues. In addition, scientific insights and tools can be of assistance, and the use of climate risk maps can help to create a common language.

Capacity building of diverse actors is critical to enable the integration of EbA in local planning processes and to strengthen the role of local actors in promoting EbA. Grenada and Brazil demonstrate the role of capacity building for EbA at different levels to strengthen ownership and promote good governance.

Case study: Brazil
A strategy for capacity building in EbA in the Atlantic Forest

Climate risk: Change in precipitation pattern and increase in temperature

Ecosystem: Tropical and sub-tropical rainforest

Location: The project's regional focus is on three regions of protected area (PA) mosaics of the Atlantic Forest: Extreme South of Bahia (state of Bahia), with 640,000 ha; Central Fluminense (state of Rio de Janeiro), with 300,000 ha; and Lagamar (coast of the states of São Paulo and Paraná), with 650,000 ha. Besides, the Northeast Region of Brazil is a focus area for training in the area of EbA and restoration.

EbA solution: The project aims to strengthen the technical and institutional capacities in the project's regions and at federal level, in the context of the National Adaptation Plan (NAP), to foster EbA mainstreaming in public policies and territorial planning instruments, as well communicating and promoting the EbA approach. The capacity building takes the form of a methodological course and Training of the Trainers (ToT).

Lessons learned:

1. Participative development of the capacity building strategy: ensuring the integration of the lessons learned from the first activities and the adjustment to the local context into the final strategy, as well as the construction of a network of stakeholders and institutions that were involved from the beginning.
2. Focus on the training of trainers and the institutionalizing of the capacity building on the topic EbA is key for effective and long-term training strategy.
3. Integration of the capacity building strategy into local processes and other related activities occurring in the same time: assuring synergies with the capacity building activities and local projects and promoting of the immediate application of the acquired knowledge in the capacity building courses context.

Photo: Project archive

Case study: Grenada

Building the Case for Ecosystem Based Adaptation in Small Island Developing States

Climate risk: Sea level rise, coastal erosion

Ecosystem: Coastal and marine ecosystem

Location: As a Small Island Developing State (SIDS), Grenada is especially vulnerable to climate change and most of all sea level rise and extreme hydro-meteorological events. Grenada's coral reefs have already been irreversibly affected by climate change (for example: loss of Acropora coral species), thus reducing their ability to provide coastal protection.

EbA solution: The project focused on capacity building; conducting research and monitoring; raising public awareness and education on coastal ecosystem services; spatial planning and management; developing sustainable financing mechanisms; and integrating EbA into relevant policies and plans. The project worked with the local coastal communities to build their capacity for coral reef restoration. It created taskforce committees "Coral Gardeners" at both pilot sites that incorporate community members, government officials, technical personnel and other stakeholders.

Lessons learned:

1. The formation of a new skilled profession in Grenada called "Coral Gardener" where community members have been trained and hired to work in the coral nurseries to maintain and manage key reef restoration activities. Being a "Coral Gardener" involves weekly maintenance of coral nursery structures on which corals are grown in the nursery, and the planting and monitoring of these pieces along the reefs earmarked for restoration.
2. Successful design and packaging of a systematic process for training persons in the construction and installation of coral nurseries and on coral nursery and reef management and maintenance is key to an effective training.

Insight 5:
EbA embraces indigenous and local knowledge systems

Indigenous peoples and local communities have managed variability, uncertainty and change through the history while interacting with the environment. Indigenous and traditional knowledge and coping strategies can thus form an important basis for climate change and disaster risk reduction responses, complementing scientific evidence, and bridging gaps in information.

Indigenous, traditional and local knowledge systems can play a significant role to early warning systems and to identify effective adaptation solutions based on local biodiversity.

EbA solutions consider diverse cultures and knowledge systems to generate social benefits and support the most vulnerable.

EbA can foster the recollection of abandoned practices, such as indigenous and traditional agricultural practices. Integrating the knowledge of indigenous peoples and local communities also involves an appreciation of their cultures and visions and an acknowledgement of their role as knowledge holders and rights holders (CBD, 2019). A case study from Costa Rica presents the importance of integrating indigenous knowledge for the design of effective EbA solutions.

Case study: Costa Rica
Ecosystem-based Adaptation for the Indigenous Territory of Bribri

Climate risk: Increase in frequency and intensity of rainfall, change in rainfall seasonality

Ecosystem: Tropical forest

Location: The project is implemented in the Territory Talamanca-Valley of the Star of Costa Rica. The Talamanca Mountain Range and the Bribri indigenous territory belong to the La Amistad Caribe Conservation Area and the La Amistad International Park.

EbA solution: The EbA solutions seek in particular to address food insecurity in the indigenous territory. The solutions were identified in a participatory manner to point out key climate impacts on the local livelihoods and combine ancestral knowledge with scientific knowledge, seeking, among others, to increase the diversity and productivity of crops, the protection of soil and water sources, and the maintenance of forest cover on farms.

Specific agroecosystems were identified - polyculture of cocoa, musaceas, cocoa-musaceas and banana.

Lessons learned:

1. The identification of adaptation measures has been based on the rescue of ancestral knowledge (Adaptation based on Communities), which in turn implies understanding the indigenous farm as an integral farm, that is, an agroecosystem.
2. The diversification of endemic species of the territory and its uses, mainly of tree species, both timber and fruit trees, and the protection and regeneration of native forest species are a priority; along with the selection of crop varieties that present good responses to drought and / or floods.

Insight 6:
EbA solutions are a vital part of national and sub-national adaptation strategies

EbA solutions play a critical role in achieving national development and adaptation goals and should form part of overall adaptation strategies. The effective integration of EbA into adaptation strategies and wider sectoral or cross-sectoral planning are important and can be promoted by demonstrating evidence of the effectiveness of EbA that can be understood by decision makers in the context of their own political remit. EbA solutions should align with national, regional and local plans and policy measures (i.e. laws, regulations and enabling instruments). Actions geared at influencing policies and integrating EbA should form an integral component of any EbA project throughout its planning and delivery (CBD, 2019). This will enhance long-term sustainability and possibilities for funding.

EbA feeds into existing development and climate change policies at multiple levels to contribute to the achievement of adaptation targets.

Key national adaptation strategies are the (Intended) Nationally Determined Contributions ((I)NDC) and National Adaptation Plans (NAPs).

(Intended) Nationally Determined Contributions ((I)NDC) are a set out high-level objectives and a vision for addressing adaptation goals. Altogether, 30 of the 32 (I) NDCs in Latin America and the Caribbean include a section on adaptation, where a most recognised matter of urgency is the alarming reduction in water availability. Agriculture and the potential food security implications are another dimension that concerns many of the region's countries, as well as the climate-induced impacts on human health, outlined by 23 countries. Other important sectors are forests, ecosystems, the coastal zone (especially for those countries located in the Caribbean), infrastructure and housing (European Commission, 2019). The majority of NDCs include ecosystem-based in one form or another (Seddon et al. 2019).

National Adaptation Plans (NAPs) aim to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience; and integrate climate change adaptation into policies, programmes and activities within all relevant sectors and at different levels. The main elements in developing a NAP are laying the groundwork and addressing gaps, preparatory elements including identifying and appraising adaptation options, implementation strategies; and reporting, monitoring and review. The NAP process is a key tool for coherent implementation of an (I)NDC adaptation component (GIZ, 2016). Therefore, integrating EbA in the NAPs will have a great effect.

Examples from the case studies in Uruguay, Mexico, Peru, Brazil and Grenada demonstrate how EbA has been integrated in national and sub-national adaptation processes (Table 2). The case study from Uruguay highlights that the analysis of the cost and effectiveness of EbA measures and as well scenarios

presenting "with adaptation" and "without adaptation" were very useful to better inform the decision makers. This has facilitated the understanding that the failure of innovative measures does not involve political costs, but rather demonstrates political willingness to make changes. The case studies in Uruguay and Peru, demonstrated that the implementation of adaptation pilots with the EbA approach, allowed the accumulation of learning and feedback in the work at local scale that allows to be used for future national adaptation planning. The EbA solutions carried out in the case studies determine a set of specific measures, which can be replicated in similar contexts.

Tab. 2. Summary analysis of the contribution of the case studies to integrating EbA in national and sub-national policy frameworks.

Case studies	How does the project contribute to the integration of EbA in national and sub-national policy frameworks?
Brazil	The project resulted in (1) mainstreaming of EbA approach in the National Adaptation Plan (NAP) of Brazil; (2) instruments for land use planning, such as Municipal Plans for Conservation and Restoration of the Atlantic Forest; (3) the elaboration of nine Municipal Plans in Bahia; (4) Integration in a distance training course for the elaboration and implementation of the Municipal Plans with more than 600 participants; (5) Support to the planning of policies on mitigation and adaptation based on ecosystems in an area of several thousand hectares located in the Atlantic Forest region, contributing to the conservation and maintenance of environmental services while reducing the vulnerability of communities to the different climate risks.
Grenada	As a result of the project, key elements of EbA are now highlighted as part of the strategic objectives of Grenada's National Adaptation Plan, Nationally Determined Contributions (NDC) and revised Climate Change Policy.
Mexico	The adaptation component of the NDC includes EbA approach and is promoted in the implementation of the Adaptation Project in Coastal Wetlands of the Gulf of Mexico. The project has demonstrated the effectiveness of the EbA approach.
Peru	The project is mentioned in the INDCs as part of the adaptation to climate change efforts in Peru. The project also supported the process of integrating the EbA approach into the Regional Climate Change Strategies of Junín and Lima.
Uruguay	The implementation of EbA measures in the town of Kiyú as well as other similar experiences in the coastal area (altogether approx. 680 km) has contributed to promote EbA in the National Plan of Coastal Adaptation of Uruguay and the National Policy for Climatic Change. Likewise, the EbA interventions served to improve the articulation of the actions in the subnational level and its integration into the local regulations and land management plans.

Challenges for EbA mainstreaming and implementation

An enabling environment is vital for effective implementation of EbA in different contexts. Key enabling factors that support the process refer mostly to climate information, institutional arrangements, policy framework, and capacities. Although significant progress, some of the challenges for strengthening EbA in national policy frameworks remain.

There is a **weak institutional coordination and collaboration between stakeholders**, which affects the EbA governance. Institutional arrangements for the implementation of EbA are critical for the governance of EbA at long-term. However, such arrangements are often unclear and overlapping, thus hindering the effective implementation of EbA solutions.

Fragmented national policies are limiting the opportunities for EbA mainstreaming. There is limited horizontal and vertical coherence of development and climate change policies in most countries. This in turn, limits the alignment between policies and sectoral action plans with regards to adaptation measures, which is a barrier for the effective implementation of EbA solutions.

Limited technical capacity of national institutions to support the validation and implementation of EbA initiatives: National entities count with limited capacity to respond to the needs for technical assistance for revision and approval of EbA project proposals pursuing public investment.

Lack of quality and detailed downscaled climate information to inform adaptation and planning processes. Climate information is often general, at national and sub-national levels. The generation of climate projections in the countries are often hindered by the high heterogeneity (terrain, climate) and the lack of long-term meteorological data. The information based on the impacts/risks of future climate change is low, especially for specific climate risks and associated potential impacts on ecosystems and their services. This is a barrier for the design of adequate EbA solutions.

Lack of an integrated knowledge platform on climate change and ecosystem assessment data at a national level. Although there are multiple online platforms related to climate change and ecosystem management at national level, often they are not adequately coordinated and there is lack of data consistency (e.g. format, methods of data collection, etc.) and comprehensive repository with information on climate impacts on ecosystems and livelihoods to guide the design of EbA solutions.

Need for comprehensive metrics and monitoring systems to capture EbA effectiveness and impacts. Defining the effectiveness of EbA solutions goes hand in hand with a lack of project monitoring and evaluation processes, ambiguity in terms of selecting adaptation indicators to measure progress, and a general lack of systematization of results. Monitoring and Evaluation (M&E) of EbA are critical for assessing progress and efficiency and effectiveness of interventions. Monitoring enables adaptive management, however, often government agencies lack technical and human resources to establish adequate M&E mechanisms for EbA and adaptation in general.

Photo: Practical Action

Key messages for strengthening the role of EbA in adaptation strategies in the Latin American and the Caribbean region

In order to strengthen EbA, it is essential to consider the multiple dimensions of governance including:

- **Creating scientific evidence and data to support and inform policy making and fill-in knowledge gaps related to the impacts of climate change and the benefits of the EbA approach.** Is critical to generate climate-related evidence from climate scenarios using different levels of resolution in different time frames, developing climate risk assessments and producing socio-economic vulnerability maps that take into account ecosystem and anthropogenic drivers of change. Adopting a landscape approach for the analysis of such factors is required in order to adequately assess the complexity of the socio-ecological system. This information will make possible the evaluation of the different risks and lines of impact, and design adequate adaptation solutions to address them. Such information should be tailored to the needs of decision makers in order to better inform, build capacities and create empowerment for decision making.

- **Revising the national, subnational and local planning and regulatory frameworks to create an enabling environment for EbA integration and implementation.** From the analysis of the different policies, planning instruments, strategies and budgets, it is possible to identify elements that may be not well aligned with adaptation objectives. These points may reflect perverse incentives that hinder adaptation processes or strategies that may result in maladaptation. Revision of budget lines is critical for the mainstreaming of adaptation solutions in national and sectoral development.

- **Screening the revision cycles of the different policies, planning instruments and budget adjustments oriented at fostering development processes to identify entry points for EbA mainstreaming in development planning and national adaptation strategies.**

The revision of policies and budget structures provides multiple opportunities for the identification of entry points for integrating EbA in planning and budget allocation.

- **Strengthening national and sub-national monitoring and evaluation mechanisms aimed at assessing the progress of EbA solutions to generate evidence and provide feedback to current and future initiatives.** The design of suitable and gender sensitive indicators to measure progress, development of monitoring and evaluation systems and generation of lessons learned, and good practices strengthens the role of the EbA approach by generating evidence of the adaptation benefits of this approach in the region.

- **Reinforcing the role of local governance in elaboration and implementation of EbA strategies is essential to ensure adequate adaptation and sustainability of initiatives.** As demonstrated throughout the assessment, local actors (e.g. municipalities, local businesses, local communities and indigenous associations) play a leading role in promoting and implementing EbA measures guided by their good knowledge on the factors shaping the vulnerability of the local population and ecosystems. The engagement, sense of ownership and leadership of municipalities, local institutional structures and local communities are key to effective implementation of EbA.
  The role of Municipalities: Although municipalities have a particular advantage in understanding the context and immediate needs, often their capacity is constrained by weak technical and organizational capacity, limited access to evidence and data, weak linkages with other institutions at different levels, inadequate systems for gathering and disseminating information, and unclear mandates and conflicting priorities between levels and agencies. Therefore, continued and specialized capacity strengthening of local officials and technical assistance from relevant organizations are crucial to address these challenges and enable the leadership of local actors in mainstreaming EbA.
  The role of communities: traditional knowledge is an important part of the ecosystem approach, can complement science, and bridge gaps in information. Indigenous, traditional and local knowledge systems – and forms of analysis and documentation such as community mapping – can play a significant role in identifying and monitoring climatic, weather and biodiversity changes and impending natural hazards, similar to early warning systems.

- **Need for better articulation with existing institutional structure at local level.** Experiences show that often parallel governance structures are formed for implementation of projects. So far there has been limited coordination with local institutions as for example management authorities for community reserves, which conditions the sustainability of adaptation initiatives. It is essential to engage with the existing local structures and use existing implementation processes

Photo: Practical Action

and mechanisms to encourage ownership of EbA at local scale and ensure long term impacts.

- **EbA with a landscape or seascape approach enhances the resilience and multiple uses and allows for development issues to be addressed in a multifaceted way.** Landscapes provide different goods and services to different stakeholders, therefore managing ecosystems and socio-economic issues at landscape scale supports the integration of social, economic and environmental objectives.

- **Integrating a gender approach strengthens the implementation of EbA measures and provides holistic adaptation results.** Given that climate change impacts are differential on people and that women, other minority groups such as LGBTIQ, indigenous and elderly people are more vulnerable, it is vital to consider these vulnerabilities and different capacities for the design and implementation of EbA solutions.

- **Government capacities are a key asset for the implementation of EbA solutions.** The capacity of public institutions to integrate adaptation into their development planning and budget allocation schemes depends largely on the political will and technical capacity of their public officials to do so. It also depends on their ability to coordinate actions and promote top-down approaches to land adaptation policies on the ground.

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