

NbS Examples Submitted by Children and Youth Major Group to the Intergovernmental Consultations on Nature-based Solutions

Africa

Kenya

Community-led mangrove forest restoration and seaweed farming in the Southern coastal region of Kwale County, restoring lost and fragile mangrove forests to protect ecosystems, livelihoods, and people. Seaweed farming with a high level of female participation is also providing an additional source of income. Nature-based Intervention:

Four communities managing about seventeen hectares of land in the southern coastal region of Kwale County, Kenya are responding to the challenge of climate change induced perturbations to rainfall patterns, increased intensity and frequency of storm surges and heatwaves by restoring and replanting weakened or destroyed mangrove forests. Community-based groups with equal representation of women and men are actively growing and managing mangrove seedlings with 243,000 planted to date. As the coastal mangrove forests are restored, communities have also started seaweed farming, a non-invasive, non-polluting activity that can provide an extra source of income. These combined efforts are helping households counter the economic and health stresses and shocks caused by reported declines in fish productivity.

Overview of context and outcomes:

Mangrove forests provide protection from coastal flooding, coastal erosion, and storm surges while simultaneously providing and sheltering the habitats of a wealth of native species in both coastal and inland areas.

Climate change mitigation:

Even though the effectiveness of this project on carbon sequestration and storage has yet to be quantified or reported, mangrove, seaweed, and tree planting in this area is likely to contribute to the carbon sequestration potential of the area.

Adaptation:

Both mangrove forest restoration and seaweed farming will likely provide better protection from flooding, storm surges, and coastal erosion. Furthermore, seaweed farming as well as increased biodiversity from mangrove restoration have reportedly boosted the incomes and economic security of participating communities that face various pressures to their fish stocks.

Ecosystem health:

The restoration and replanting efforts have reportedly led to a significant increase in trees grown and managed with an observed 80% survival rate of seedlings planted. 137,000 seedlings were planted during the two-year course of the project, with planting continuing even after the project's formal close. Furthermore, nearly 8,000 fruit, native, and charcoal replacement tree seedlings have been planted.

Socioeconomic outcomes:

The project placed a strong emphasis on gender-balanced participation, with all community groups boasting 50% female engagement in seedling planting, both in inland and coastal sites. According to pre-project assessments, communities expressed a strong interest in diversified, sustainable income streams at the start of the project and the introduction of seaweed farming has reportedly provided an alternative livelihood option. At the time of the project's formal close, 91 seaweed farms were active, reportedly producing between 10.73 and 20.3 tonnes of seaweed per year, mainly harvested by women at an average net profit of KSh 13,867 (about 90 £GBP) per farm. Because the crop cycles of the seaweed planted are relatively short, communities have reported being able to harvest several times a year at a very low cost with an average net profit per cycle of KSh 2,000 (13 £GBP). As a result of this additional income stream, women in the communities reported higher investment in school fees, healthcare expenses, water and sanitation improvements, and housing.

Finance:

This project was funded by Plan International with further support provided by the Kenya Marine and Fisheries Research Institute and the Kenya Forest Service.

Morocco

Aiming to serve as an example of more participatory ecological restoration in semiarid areas of North Africa, this initiative in the Béni Boufrah area involved scientists, managers, and local stakeholders in every part of a project aiming to restore an area of *Tetraclinis articulata* forest in Morocco.

Nature-based Intervention:

A group of researchers launched a Participatory Ecological Restoration project in the Béni Boufrah Forests. The approach was based on knowledge sharing, trust, and active stakeholder participation with scientists, managers, and local stakeholders involved in and guiding every step of the process from planning to outcome monitoring. This participatory process was applied to all steps of the restoration initiative including the identification of restoration priorities, assessment of land-use options, definition of the restoration procedure, participatory plantation, evaluation, surveillance, and monitoring. Specifically, the restoration efforts were conducted on a one-hectare area of land where 250 plants were planted by 90 participants (57 men and 33 women). The area is primarily *Tetraclinis articulata* forest. As such, a stakeholder workshop concluded that the planting of *Tetraclinis* and other similar wood species would be most appropriate.

Overview of context and outcomes:

Semiarid regions of North Africa face frequent challenges of land degradation resulting from both human- and climate change-induced pressures. Simultaneously, efforts to achieve the ecological restoration of previously degraded land have had minimal success as they are often conducted in an often non-participatory and top-down manner.

Adaptation:

Community members reported a wide range of ecosystem services provided by the restored forest area, including services linked to the most critical local problems of erosion and flooding.

Ecosystem health:

Fourteen out of fifteen total survey respondents reported the integrity of the restored plot and recovery of native vegetation as the most relevant indicators of success. Recent monitoring has shown an increase in the cover and composition of spontaneous vegetation. The seedling survival rate 18 months after planting was 60% for *Tetraclinis* and 90% for *Pistacia*.

Socioeconomic outcomes:

A post-intervention report emphasized that the signature of an agreement between stakeholder groups was reported to represent their will to overcome disagreements, to trust each other, and to work together for the purpose of conserving and restoring local natural resources. The active involvement of women was reportedly sought throughout each step of the project, although many women faced restrictions as a result of their responsibility for housework and family care.

Finance:

The project is funded by the University of Abdelmalek Esaàdi in Morocco and the University of Alicante in Spain.

Asia Pacific

Indonesia

The Pemuteran Bay Coral Protection Foundation aims to address the collapse of local fish stocks by implementing artificial coral reefs and creating a locally-managed Marine Protected Area (MPA) to restore marine biodiversity.

Nature-based Intervention:

In the face of devastating fish stock collapse and loss of coral reefs due in part to destructive fishing techniques such as reef bombing, the village of Pemuteran on the Indonesian island of Bali has engaged in a combination of approaches which have reportedly resulted in positive ecological and socioeconomic outcomes. Firstly, the foundation has overseen the installation of 70 'Biorock' technology artificial reefs, consisting of steel-frame structures through which a low voltage electric current is passed, attracting calcium carbonate buildup and becoming an effective substrate for the establishment and rapid growth of coral. Secondly, the foundation, working closely with the national enforcement agencies to ensure compliance, has supported the reintroduction and enforcement of locally-managed Marine Protected Areas (MPAs) which strictly forbid unsustainable fishing practices. Lastly, other activities organized by the foundation have contributed to the regeneration of the coral reefs and fish stocks, such as the planting of vetiver grass on shorelines to reduce erosion and excessive run-off, as well as waste and sewage management. According to project reports, the 70 structures span two hectares, reportedly making this the largest coral reef nursery restoration project globally.

Overview of context and outcomes:

Biorock corals have been shown to grow three to five times more quickly than natural coral, and are also more resilient to the effects of temperature fluctuations, with coral survival rates between 16-50 times higher.

Adaptation:

The Biorock coral reefs have reportedly been shown to absorb wave energy, reducing beach erosion and the risk of disaster impacts. According to a project report by the Equator Initiative, Biorock was found to be more effective than sea walls at reducing beach erosion, since waves deposit sand on the shoreline, building up the beach instead of eroding it.

Ecosystem health:

According to project reports, local coral reefs have been restored and fish populations have been replenished. The abundance and diversity of marine species around the reefs have reportedly grown substantially, including populations of dugongs, which were considered locally extinct prior to the project.

Socioeconomic outcomes:

Fish stocks, which are critical to the food security and livelihoods of the villagers, have reportedly been replenished. As a result of the restored reefs and marine biodiversity, the area has become a popular ecotourism destination for diving and thus the number of jobs in the local tourism industry has reportedly increased substantially. Further successful efforts to drive tourism have included the creation of unique reef art installations and the reinvestment of private tourism proceeds into conservation activities.

Finance:

The project has received financing from village funds, the UNDP, and the Global Coral Reef Alliance.

Cambodia

Monks Community Forest is an 18,261-hectare evergreen forest in northwest Cambodia in which a unique approach to law enforcement based on Buddhist principles demonstrates the power of linking conservation with traditional customs and beliefs.

Nature-based Intervention:

In response to widespread deforestation, the monks of Samraong Pagoda acquired the legal right to protect the surrounding forest, established patrol teams, demarcated the forest's boundaries, and raised environmental awareness among local communities. Now Cambodia's largest community forest, it is co-managed by a committee of diverse stakeholders and, while logging and hunting are prohibited, villagers may use traditional fishing methods, collect fallen timber for construction, and harvest non-timber forest products (NTFPs). Moreover, villagers are encouraged to fish, collect materials for their shelters, and harvest non-timber forest products such as bamboo, wild ginger, fruit, and mushrooms for subsistence use and for traditional medicines, as well as to sell in local markets.

Overview of context and outcomes:

Because of their role in Khmer society as moral and spiritual leaders, the involvement of monks in the management and patrolling of the Monks Community Forest brings legitimacy to forest protection efforts and has reportedly served as a powerful deterrent to forest crimes including illegal logging and hunting. The monks have been able to cultivate a conservation ethic among villagers living near the MCF by explicitly linking nature conservation to the life of the Buddha, and to Buddhist principles such as karma and living a moral life. As a result of awareness-raising efforts, most Buddhist villagers see forest protection as benefiting them spiritually.

Climate change mitigation:

While not quantitatively evaluated or reported by the study, it is probable that the initiative has contributed to climate mitigation through the creation of and continued monitoring of the 18,261-hectare community forest which has reportedly prevented deforestation. Monks Community Forest is one of thirteen community forests involved in Cambodia's first reduced emissions from deforestation and forest degradation (REDD) carbon offset projects.

Ecosystem health:

Patrolling and awareness-raising activities have reportedly reduced logging, hunting, and land clearing inside the Monks Community Forest, likely greatly helping to safeguard the area's biodiversity. The area is known to be home to a number of threatened species, including the Sun bear, gibbon, gaur, slow iris, leopard, Green peafowl, Greater and Lesser adjutants, pangolin, and dholes.

Socioeconomic outcomes:

According to a project report, the harvest of NTFPs, especially mushrooms, from the Monks Community Forest can be very lucrative constituting an important cash source for local villagers. Over 3,700 people from six villages participate in and benefit from Monks Community Forest Activities. The vast majority of participants and beneficiaries are poor farmers who are often economically marginalized without land titles. The community forest provides resources, benefits, and services such as shelter, subsistence crops, and commercial products, all of which are essential for their survival and well-being. The income from the new REDD projects has the potential to provide sustainable financing for protection activities and livelihood support to local communities over the long term.

Finance:

The project has received funding from the UNDP, the NGO Buddhism for Development, Community Forestry International, and income through REDD+ in partnership with the Forestry Administration.

Borneo Highlands on the border of Malaysia and Indonesia

A trans-border alliance between local indigenous populations sharing a cultural heritage on the island of Borneo works to preserve indigenous culture and knowledge, promote sustainable agriculture, and conserve the island's largest intact forested and traditionally farmed catchment.

Nature-based Intervention:

Local indigenous groups came together to create the Forum Masyarakat Adat Dataran Tinggi Borneo (FORMADAT) or the Alliance of the Indigenous Peoples of the Highlands in the Heart of Borneo to advance conservation and development goals. FORMADAT promotes sustainable agriculture techniques, agroforestry, the use of diverse and native varieties of rice, and the establishment of nurseries to breed distinctive species of local fruit which have been domesticated and bred over generations. The inhabitants of the highlands use a traditional wet rice farming system and cultivate native fruit and rice varieties, often partnering with NGOs and gaining organic and fairtrade certifications to access niche markets. The traditional wet rice farming method involves the use of a wet paddy system irrigated by mountain waters. Once the rice is harvested, water buffalo are released to churn and fertilize the soil. This system allows for greater food production as opposed to shifting agriculture and also maintains the integrity of the local water supply as communities do not rely on chemical inputs for agriculture. Agroforestry has been practiced sustainably by the local communities for generations through which they derive timber, medicinal plants, foods, dyes, and materials for handicrafts. FORMADAT created a Cultural Field School in 2011 to preserve local knowledge and educate locals and tourists about the cultural and agricultural practices of the area.

Overview of context and outcomes:

The island of Borneo is politically divided between Malaysia, Indonesia, and Brunei. In the highlands of Borneo, the Dayak Lundayeh/Lun Bawang, Kelabit, and Sa'ban peoples of Indonesia and Malaysia share a cultural and historical heritage. The highlands of Borneo exhibit the largest surviving intact forested and traditionally farmed catchment on the island.

Adaptation:

The nurseries created have reportedly increased the variety of nutritional options and richness of fruit varieties available. The nurseries are also seen by local communities to serve as a buffer against climate change impacts on agriculture.

Ecosystem health:

FORMADAT has reportedly improved the conservation of agrobiodiversity through the promotion of diverse rice and fruit varieties.

Socioeconomic outcomes:

FORMADAT has trained more than 300 farmers in internal control systems (ICS) with the aim of helping them attain organic certification. Partnerships with NGOs have provided access to niche markets; however, international distribution and transport challenges remain.

Finance:

The project received financial support from the WWF, the Lundayeh Ethnic Association, the Indonesian Department of Education, the International Tropical Timber Organization, and the UNDP.

Sri Lanka

Bioremediation, restored vegetation, and organic farming methods have been implemented to reduce high levels of groundwater nitrate contamination and boost food production.

Nature-based Intervention:

In order to reduce dependence on chemical fertilizers, restore existing water resources, and regenerate the local ecosystem, the community engaged in bioremediation and biological fencing around production and planting areas. Bioremediation is the process of using organic microbes to clean up contaminated soil or groundwater. First, deep-rooted trees were planted close together to form a root mat that would facilitate the uptake of contaminants. Bioremediation requires a carbon-rich environment; therefore, coconut peat and straw were added to the sandy soil. As the surrounding trees grew, their leaf fall and detritus naturally provided the organic matter required for bioremediation. Furthermore, in order to boost agricultural production as well as restore the weakened local ecosystem, trees able to withstand salt-laden sea breezes were planted as wind-breaking fences. Within and around the plant fences, monocropping was replaced with more organic agricultural methods. Nearly 8,000 plants of fifty-four different species were planted on the project site. The intervention's success inspired its implementation in over 1,000 wells in Kalmunai on the opposite coast of Sri Lanka.

Overview of context and outcomes:

In response to traditionally low and increasingly erratic rainfall in the region, local communities in Kalpitiya Peninsula had begun to withdraw water for crop and domestic use from the underlying aquifer. However, a high dependence on chemical fertilizer for monocropping had caused nitrates to seep into farm and domestic wells. Not only does such contamination contribute to the release of nitrous oxide, a greenhouse gas, but also implicates local health and well-being. At the start of the project, it was reported that 64% of local infants had methemoglobin levels above the recommended range, a consequence of nitrate contamination. Additionally, the stability of local vegetation had been compromised by increasing temperatures, salt-laden winds, and the clearing of formerly protective mangroves and other trees for shrimp and agricultural production.

Climate change mitigation:

Although not quantified, it is likely that the observed increase in local tree and vegetation cover will strengthen the carbon sequestration potential of the region. The increased uptake of organic farming methods will likely contribute to mitigating the escape of nitrous oxide, a greenhouse gas.

Adaptation:

The transition from monocropping has reportedly increased crop diversity allowing harvesting throughout the year, an important risk reduction outcome in the face of the forecasted likely climate change-induced impacts on seasonal predictability.

Ecosystem health:

Soil fertility was reported to have increased, likely reducing community dependence on chemical fertilizer. Trees planted in the lagoon landscape are expected to help protect the coastline and recover habitats for both aquatic and terrestrial species.

Socioeconomic outcomes:

Water testing showed a decrease in levels of nitrates from 58.5 milligrams per liter in 2004 to 12.1 milligrams per liter in 2008. Although not measured, this is likely to reduce the health consequences of high nitrate levels. As a result of improved soil quality and more organic farming methods, garden owners reported a greater ability to use harvests for domestic consumption.

Finance:

Funding for the project came from the National Water Supply and Drainage Board.

Eastern Europe

Bulgaria, Romania, Ukraine, and Moldova

The Lower Danube green corridor project is a collaboration between Bulgaria, Romania, Ukraine, and Moldova to create a green corridor along the entire 1,000+ km stretch of the Lower Danube River in order to reduce the risk of major flooding events and bolster local economies.

Nature-based Intervention:

The Lower Danube green corridor project was formed as an agreement between the governments of Bulgaria, Romania, Ukraine, and Moldova to restore 224,000 hectares of floodplain as part of a broader green corridor which would include a preserved area of 935,000 hectares along the Lower Danube river. As of 2020, more than 60,000 hectares of floodplains have been restored. Alongside this restoration, there have been dike removals along the river to allow for it to resume its natural flow patterns and causing over 750 hectares of land to naturally return to a flooded state. Invasive plants were also an issue along the river, so investments were made to clear these plants and traditional cattle breeds were brought in to graze the invasive plants. Native vegetation was also planted along the corridor with tens of thousands of native trees planted along the river and areas created for natural forest regeneration.

Overview of context and outcomes:

The lower Danube River is an important regional river that has faced large-scale degradation over the last century. The river had been cut-off from three-quarters of its natural floodplains due to the construction of dikes which has led to large changes in its flow course. This puts the region at greater risk as it is highly prone to flooding and this is likely to be exacerbated by climate change. Gravel extraction, dredging, and dam construction along the river have also led to lower water tables in nearby agricultural lands and the erosion of the riverbed. The river has also experienced high levels of eutrophication due to agricultural run-off.

Climate change mitigation:

Whilst no mitigation outcomes are reported, the large-scale forest regeneration and tree planting programs likely lead to an increase in carbon sequestration.

Adaptation:

The project has worked to reduce flood vulnerability faced by communities along the river by decommissioning underperforming flood protection dikes and restoring floodplains. These restored landscapes are reportedly a more successful mechanism of floodwater retention and allow for overall lower infrastructure maintenance costs. During the 2013 flooding event on the Danube River, the lower Danube reportedly did not flood despite the higher-than-normal water levels. The landscape reportedly also helps with drought management by holding and slowly releasing a larger volume of water.

Ecosystem health:

The project has worked to improve habitat extent and habitat quality along the river. This is vitally important as there have been 5,137 species reportedly identified along this stretch of the river. The landscape is also reportedly a habitat for some of Europe's rarest fish, such as the five species of sturgeon which call the river home. This includes the critically endangered beluga sturgeon (*Huso huso*) which travels up the river to spawn. This landscape is also vital for birds with 331 species utilizing the river and 90% of the world's Red-breasted geese (*Branta ruficollis*) living here. The restoration of natural river vegetation and restoration of the floodplain is also reportedly helping recharge groundwater resources and purify the water in the river.

Socioeconomic outcomes:

The river is a highly important resource for the 29 million people who live in the basin. The improved river landscape reportedly had benefits for the collection of natural resources such as fish and reeds through the improved habitat quality. The landscape also reportedly generates €140,000 in tourism revenue annually. The community received increased flood protection which reportedly reduced the cost of environmental damage to nearby residents. The WWF estimates that the net value of the restored floodplain and river amounts to €111.8 million per year.

Finance:

The main funders of the project so far have been the WWF, national governments, the EU, and the business sector. The estimated cost of completing the entire restoration is 183 million euros.

Republic of Moldova

The Moldova Soil Conservation Project (National Programme) focuses on restoring degraded lands across the country through wide-scale reforestation efforts covering 20.3 thousand ha of previously degraded lands.

Nature-based Intervention:

The project focused on using reforestation and afforestation to repair degraded lands and vulnerable soils. This included the return of 20.3 thousand ha of previously degraded lands back into general

production. The implementation of this program involved working with a network of 383 communities and 23 forest enterprises within the country. Over 60% of the project sites are owned by local communities and planting took place at 2,421 different project locations. The project also opens up the use of the forests for sustainable timber harvesting and the harvesting of non-wood forest products in order to bolster local livelihood outcomes. In areas that are highly degraded the project utilized fast-growing tree species such as *Robinia pseudoacacia* and *Gleditsia triachantos* to stabilize the soil and once the landscape has recovered the species can be harvested and replaced with native oak and ash.

Overview of context and outcomes:

Moldova faces widespread risks from land degradation and soil erosion. More than 50% of the country's territory is located on land which has an incline making it vulnerable to erosion and gully formation. The erosion risk is widespread and more than 80,000 ha of land have been destroyed by the formation of 6,200 ravines. A goal of the project was to support Moldova's commitments to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol mechanisms.

Climate change mitigation:

The project is reportedly estimated to have 3.6 million tons of CO₂ reductions over a 20-year time span. It is reportedly estimated that the project has a net anthropogenic GHG removal impact of 179,200 tons of CO₂ annually. During the time span of 2004-2009, it is reported that 515 thousand tons of CO₂ were sequestered during the project.

Adaptation:

The project utilizes reforestation on marginal lands to reportedly stop soil erosion on these degraded hillsides. The root systems of the forest also reportedly help prevent landslides which were increased in likelihood due to the previously unstable soil conditions.

Ecosystem health:

The restoration efforts reportedly improve the habitat quality and the amount of aboveground biomass found within the ecosystem.

Socioeconomic outcomes:

The large-scale forest restoration reportedly helps to increase local community access to supplies of fuel wood, timber, and non-timber products (such as medicinal herbs and hunting), which can all be utilized by the local community to support their livelihoods. The community reportedly harvests 70,000 m³ of wood biomass annually and the management of the forests and replanting operations have created both temporary and permanent jobs.

Finance:

The 20-year financing need reported by the program is 19 million USD, 80% of which was utilized in the first five years to conduct large-scale planting. They also practice the sale of carbon credits with 1.9 million tons of carbon already contracted to World Bank Funds, 1.3 tons contracted to Prototype Carbon Fund, and 0.6 tons contracted to the BioCarbon Fund. For the 2004-2017 crediting period, it is reportedly estimated that the project will generate \$7 million.

Latin America and the Caribbean

Brazil

Indigenous community-led reforestation and agroforestry countering Amazonian deforestation in Villages in the Southeastern Amazon along the shared border between the Mato Grosso and Pará states. The Kayapó indigenous peoples are consistently fighting to defend their ancestral land from the deforestation pressures facing the Amazon. These defensive actions to preserve the integrity of their land are further supported by investments in sustainable farming and agroforestry to reduce community impacts on the ecosystems they aim to protect.

Nature-based Intervention:

The Instituto Raoni protects and surveils over two million hectares of indigenous land, including the largest remaining contiguous segment of the Amazon rainforest. Perhaps most famously, Instituto Raoni, after discovering the importance of images in their first contact with mass communication media, encourages young Kayapó community members to act as “video warriors” documenting illegal logging and other activities that risk the integrity of their land. Furthermore, Instituto Raoni works to enable and teach sustainable agriculture and agroforestry methods to support the conservation of their land. In particular, Kayapó women play a key role in their communities as the sole custodians of agriculture and work to recover degraded land and implement agroforestry principles. One of the main interventions has been the reduction in the use of fire to prepare land for agriculture to both reduce the communities’ carbon emissions and the impact of forest fires. Partnerships with NGOs have allowed for the expansion of sustainable agricultural practices, community farms, and the conservation of traditional crop varieties to further bring community needs into harmony with the surrounding landscape and ecosystem. Efforts to strengthen sustainable production chains have allowed the selling of handicrafts and non-timber forest products.

Overview of context and outcomes:

The Kayapó indigenous peoples’ land is located in the so-called “Deforestation Ring” of the Amazon where deforestation pressures are most severe. Their territory is also part of the South Amazon Ecotones Ecological Corridor which is remarkably rich in biodiversity. The Kayapó have therefore long fought to defend the land from deforestation and have come to form the Instituto Raoni as the unifying authority of this campaign.

Climate change Mitigation:

The use of fire in agriculture is reported to be the Kayapó communities’ highest source of carbon emissions. Thus, the significant efforts employed to reduce reliance on this practice is likely to contribute to mitigating the communities’ climate change impact. Although not quantified, the reduced reliance on fire in agricultural practices is likely to limit the risk of fires spreading and further contributing to deforestation.

Ecosystem health:

It is reported that Kayapó women have recovered 13 hectares of degraded land through the implementation of agroforestry systems with an emphasis on the planting of native fruit species. The protection of territory threatened by deforestation is likely to contribute to the conservation of the rich biodiversity and forest connectivity of the region.

Socioeconomic outcomes:

The strengthening of fair-trade production chains, including the production of non-timber forest products like honey, is reported to have generated income between BRL \$500.00 (US\$134) and BRL \$2,000.00 (US \$36) for nearly 70 indigenous families.

Finance:

The Kayapó's courageous actions have attracted a vast array of financial supporters including many international organizations, NGOs, and local funding partners.

El Salvador

Ecosystem-based approaches to mangrove and wetland restoration are being employed by communities in the Paz River basin, unblocking freshwater channels, removing silt in mangrove canals, and conducting a community surveillance program enforcing a Local Plan for Sustainable Extraction to strengthen and recover the local wetland ecosystem.

Nature-based Intervention:

A local NGO Unidad Ecológica Salvadoreña (UNES) in cooperation with the IUCN is implementing various ecosystem-based approaches to adaptation aiming to counter adverse impacts. First, the organisation is working to unblock and remove silt from channels and mangrove canals in the river basin to recover the hydrodynamics of the ecosystem so that freshwater can enter and restore optimal salinity levels in the mangrove system. Second, UNES is promoting the restoration of degraded mangrove areas which include areas felled for livestock grazing. Seeing as unsustainable fishing practices are known to contribute to the destruction of the mangrove ecosystem, UNES designed and implemented a Local Plan for Sustainable Extraction (PLES) to ensure that local livelihoods dependent on fish, crustaceans, and mammals align with conservation needs.

Overview of context and outcomes:

Coastal communities in the Paz River basin of El Salvador are directly dependent on ecosystem services provided by the surrounding wetlands. However, the integrity and reliability of these ecosystem services are threatened by sea level rise, mangrove loss, increased incidence of droughts, saltwater intrusion, and flooding.

Climate change mitigation:

Although no mitigation outcomes were reported, it is likely that the mangrove restoration and afforestation efforts could contribute to increasing the area's carbon sequestration potential. Community members reported that houses behind a barrier of mangroves were better protected during high tides. Community members also reported that the mangrove restoration efforts had increased the productivity of local fisheries likely improving food and income security for local communities.

Ecosystem health:

Community members reported the success of surveillance measures in ensuring mangroves were able to recover. Furthermore, crab populations are reported to have recovered since the implementation

of the interventions. The efforts employed to clear the drainage channels in the Aguacate micro-watershed have reportedly benefited the ecosystem through the improved mixture of fresh and saltwater in the mangrove ecosystem. This improvement is reported to have helped mangroves flourish even in the dry season.

Socioeconomic outcomes:

A post-project impact assessment found that the interventions had created jobs for women in the mangrove channel clearing and reforestation work. Furthermore, greater social cohesion was reported as an outcome of the project.

Finance:

This project was funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Western Europe and Other States

Canada

The Cheakamus Community Forest is a collaboration by the Lil'wat and Squamish First Nations and the Resort Municipality of Whistler (RMOW) to protect and sustainably manage over 33,000 hectares of forest.

Nature-based Intervention:

In 2009 the forest allotment surrounding the Whistler ski resort became available when the Canadian Ministry of Forests and Range announced a new Community Forest program. When this opportunity arose the RMOW created a partnership with the Lil'wat and Squamish first nations communities where all three are equal partners. Together they created the Cheakamus Community Forest which encompasses 33,000 hectares in total, with approximately 15,000 hectares being designated as an area where no commercial harvest is allowed. Sustainable forestry is part of the mandate for the land allotment, so the first nations' forestry partners use an Ecosystem-Based Management approach to harvest approximately 40 hectares per year.

Overview of context and outcomes:

Whistler is the most visited tourist destination in British Columbia and has a high profile as a major outdoor recreation destination. This area of land surrounding the Whistler resort was previously logged much more heavily and without indigenous community involvement. The commercial timber companies harvested 200 hectares annually with little available input from local people.

Climate change mitigation:

The project reportedly sequesters 15,000 tonnes of carbon dioxide per year. Since the development of the project, it has reportedly sequestered over 150,000 tons of carbon.

Ecosystem health:

There was a reported increase in habitat quality and connectivity due to a decrease in logging pressures and the designation of non-harvest zones within the community forest area.

Socioeconomic outcomes:

This intervention helped return control of the land back to the Lil'wat and Squamish First Nation when it had previously been controlled by commercial interests.

Finance:

The project reportedly earns \$100,000 from carbon credit sales annually. They also receive funding from their forestry partnerships and timber harvest.

United Kingdom

The Medmerry project for intertidal habitat restoration with managed coastal realignment on the West Sussex coast has regenerated 184 hectares of intertidal habitat, restoring wildlife functioning and protecting communities from flooding and coastal erosion.

Nature-based Intervention:

Managed realignment is the practice of building a structural sea defense inland from the coast and allowing the exposure of an intertidal area between the defense and the ocean. The Medmerry project constructed seven kilometers of flood bank inland, creating 184 hectares of salt marsh and mudflat habitat and 263 hectares of other priority habitats. The flood bank itself was built using several hundreds of thousands of cubic meters of clay extracted from the site which also led to the formation of freshwater ponds and reedbeds that have attracted wildlife back to the area. In partnership with local farmers, the saltmarsh is grazed by sheep and cattle at low density and cereals and special wild bird seed mixes are grown on land surrounding the habitat to attract and benefit wildlife. A system of collective ditch management has also created adjacent freshwater habitats for water voles, amphibians, and dragonflies, likely countering the area's recent biodiversity losses. The project has also provided a water treatment facility and a road serving 5,000 residents.

Overview of context and outcomes:

Many parts of England's coastlines are facing a loss of intertidal habitats to sea level rise and coastal erosion. Intertidal habitats such as salt marshes, mudflats, sand dunes, and shingles provide important coastal protection from strong waves, high tides, erosion, and storm surges. They also serve as habitats for important wildlife species like wetlands and shorebirds. Thus, built on years of research, the Medmerry project is practicing managed realignment to help restore the lost and weakened intertidal habitat that is crucial to the well-being of both humans and wildlife. Medmerry is one of the largest managed realignment projects on the open coast of Europe and serves an older, lower-income population that frequently faces pressures from coastal inundation. Today, the project is taught in the school curriculum nationwide and has received over 16 major national and international awards.

Climate change mitigation:

Although mitigation impacts of the Medmerry project have not been reported, it is likely that the created intertidal habitat will increase the carbon sequestration and storage potential of the area. Studies of similar systems within the United Kingdom have shown that coastal habitats play a key role in carbon sequestration and storage.

Adaptation:

The intertidal habitat is predicted to provide protection from coastal pressures such as erosion, sea level rise, and storm surges. Thus far, the project has been estimated to provide flood protection to 348 properties, many of which belong to older and low-income people. The annual risk of flooding was reportedly reduced from 100% to 0.1% and is predicted to save an estimated 78 million GBP over the coming 100 years.

Ecosystem health:

Intertidal habitat restoration combined with additional efforts to attract wildlife, including agricultural practices that protect nature such as low-density grazing, have led to an observed increase in the size and number of bird populations in the area, as reported by the Royal Society for the Protection of Birds (RSPB). This has created key positive increases in the ecosystem health metrics of habitat quality and species diversity. Due to these efforts shoveler, shelduck, teal, avocet, lapwing, and oystercatcher populations were observed to have significantly grown in size by 2019.

Socioeconomic outcomes:

The estimated benefits to local communities are now estimated at a value of up to 90 million GBP. A large proportion of the economic gain is the improved level of flood defense as compared to the shingle bank that formerly served as coastal protection and was associated with a 300,000 GBP annual maintenance cost and breached almost annually. The Medmerry project also provides an accessible recreation site with a large network of footpaths, cycle paths, and car parks providing well-being benefits to the local community as well as attracting green tourism.

Finance:

The main sources of finance in this scheme mirror the governance structures with the UK Environment Agency and the RSPB being central to the financing of the project. The environment agency is supported by the government of the UK through the Department for Environment, Food & Rural Affairs which supports the Medmerry project. Early strategic land purchases which made the project possible were financed by the Sussex Ornithological Society and the Peacock Trust.