

APPENDICES

Appendix 4 Detailed case studies

Decent Work
in Nature-based
Solutions **2022**



Appendix 4

Detailed case studies

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A strategy for urban forests in Melbourne, Australia

At a glance

Activity description and type of NbS	Urban and peri-urban forestry to restore, sustainably manage and protect ecosystems in cities
Societal challenge(s)	Climate change Human health Water security Biodiversity loss and ecosystem degradation
Partners (identifying main implementers and partners, if any)	City of Melbourne Council Several business partners
Financing (source, amount)	The public sector, developers, businesses and wider community play a key role in financing tree maintenance in the city.
Time frame	2012–2032
Geographical focus	The strategy is focused on the city of Melbourne, Australia.
Biodiversity and ecosystem benefits	Create and connect ecosystems within the city and outside Promote urban biodiversity
Employment effects	Job creation Funds/grant opportunities
Target beneficiaries (# people reached) – employment beneficiaries	11 people are employed as part of this strategy. At least 700 citizens have volunteered to carry out essential advocacy, monitoring and research tasks.
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	Residents, visitors and workers who live within or visit the City of Melbourne
Alignment with public policies	The Tree Policy.

Description of context and rationale for interventions

After more than a decade of drought, severe water restrictions and periods of extreme heat, combined with an aging tree stock, Melbourne's city trees are under immense stress, and many are now in accelerated decline. Several of Melbourne's landscapes were created over 100 years ago in a different climatic and social environment. A significant number of trees are nearing the end of their lives and landscapes are struggling to adapt to a changing climate. Combined with these problems, Melbourne's urban forest faces significant future challenges: climate change and urban sprawl.

The City of Melbourne's Urban Forest Strategy aims to address these issues and protect against future vulnerability by providing a robust strategic framework for the evolution and longevity of Melbourne's urban forest. In developing this strategy, the city recognizes the importance of a holistic "whole forest" approach to understanding and managing this invaluable resource.

The strategy also focuses on designing and planting the 'forest of the future' in a way that respects Melbourne's unique character, responds to climate change and urban sprawl, and supports the health, and well-being of the city's residents and the city's liveability in general.

Specifically, the strategy aims to support:

- **Human health:** Urban forests in the city are creating inclusive and walkable places that support citizens with cultural ecosystem services such as aesthetic design, space for recreation, and improved health through lower air pollution and stress reduction.
- **Climate change adaptation:** Climate change projections for Melbourne forecast an increasingly warm and dry climate that is liable to flooding and more frequent extremes of heat, including an increase in the urban heat island effect. One of the important functions of the urban forest is to provide shade and cooling. Canopy coverage throughout the city has increased to 25% since it began and it is minimizing the urban heat island effect by improving street-level comfort.
- **Climate change mitigation:** The benefits of the trees and the structural values of the urban forest have been calculated using a tool called i-Tree Eco to measure aspects such as air pollution control, carbon storage and sequestration, and energy savings.
- **Water security:** Drought and water restrictions can trigger irreversible decline for many trees. The city is addressing these changes directly by examining ways to keep existing trees alive while also planning the

urban forest of the future through smart species selection, improving soil moisture retention, reducing stormwater flows, improving water quality and re-use, increasing shade and canopy cover, and reducing conflicts over infrastructure.

- **Biodiversity and ecosystem restoration:** A 2009 study by the Victorian Environmental Assessment Council identified ten major threats to biodiversity in Melbourne, including fragmented landscapes, connectivity loss due to major roads, pollution, human impacts (e.g. rubbish and trampling), predation from cats and dogs, and competition from introduced species. With the potential for urban areas to encroach on brown- and greenfield sites, the likely loss of biodiversity from these threats becomes even greater. Urban ecosystems can provide opportunities for protecting and enhancing vulnerable species, as they give rise to new habitat types such as green roofs and walls, gardens, reserves and parks.

Objective

The overall objective is to make the urban forest more resilient, healthy and diverse, while also contributing to the health and well-being of the community. Its motto is to create a city within a forest rather than a forest within a city.

The strategy has set the following objectives:

- Increase the canopy cover from 22% to 40% by 2040. This would require planting an average of 3,000 trees per year (Jaluzot 2018)
- Increase forest diversity so that the urban forest population will be composed of no more than 5% of one tree species, 10% of one genus, and 20% of one family
- Improve the health of tree populations by 90% by 2040
- Improve soil moisture
- Improve biodiversity
- Inform and consult with the community

Description of intervention/activities

The main activity is urban forestry, which includes actions to restore, sustainably manage and protect urban ecosystems in the city. Priority implementation actions include:

- Review and update tree precinct plans
- Develop boulevard master plans
- Implement urban forest diversity guidelines
- Assess the value of the urban forest (see below)
- Develop a 'growing green' guide for Melbourne
- Develop community engagement programmes
- Maintain and develop a register of exceptional trees

Outcomes achieved

- The city developed a scientific formula for calculating the amenity value of trees, based on factors such as tree condition, species type and growth rate, aesthetic value and locality values. A rough estimate of the city's urban forest amenity value is around \$700 million.
- The value of environmental benefits of 982 trees in selected parks around the city were calculated through a tool called i-Tree Eco, as follows:
 - * Removal of 0.5 metric tonnes of air pollution per year, at a benefit of \$3,820
 - * Sequestration of 838 metric tonnes of carbon, at a dollar value of \$19,100
 - * Sequestration of 24 metric tonnes of carbon each year, at a value of \$548 per year
 - * Savings of \$6,370 in energy costs each year through shading of buildings in summer and provision of solar access in winter
 - * Avoided carbon emissions through a reduction in energy use by \$114 per year
- Extrapolating these numbers to the entire population of 70,000 trees gives a clear indication of the high value of the urban forest.
- Based on extensive community consultation between 2012 and 2015, each of the 10 precinct plans designed a planting schedule for each street up to 2024. Streets with a high density of vulnerable people are prioritized in the plan.
- Between 2012 and 2021, 34,950 trees were planted in the city.

ROLE TITLE	RESPONSIBILITIES	NUMBER OF EMPLOYEES
Manager	■ Coordination and leadership of the Urban Forest and Ecology team ■ Connection with networks and industry ■ Setting strategic direction ■ Urban Forest and Ecology advocacy	1
Senior Urban Forester	■ Implementation of the Urban Forest Strategy ■ Management of the tree planting programme ■ Implement the Urban Forest Precinct Plans ■ Manage tree protection and planting for major projects ■ Coordinate programmes such as Urban Forest Fund ■ Tracking of urban forest targets through regular coordination of data collection such as canopy mapping ■ Development of new programmes, strategic plans and initiatives ■ Tree risk management	4
Urban Forester	■ Review of planning applications and implement tree protection conditions ■ Tree valuations and tree protection bonds	1
Arborist	■ Implementation of Tree Policy to ensure protection of trees	1
Senior Ecologist	■ Implementation of the Nature in the City strategy and coordination of targets ■ Project management for capital works ■ Stakeholder engagement	1
Volunteer Coordinator	■ Management of volunteer programs and citizen science (including Gardens for Wildlife and Citizen Forester programmes)	1
Project Officer	■ Delivery of projects to assist in the implementation of the Urban Forest Strategy and Nature in the City Strategy ■ Administration tasks ■ Addressing of customer service requests	2

Employment effects

Eleven NbS jobs were created as part of this strategy, including both coordination (a manager, two project officers, and a volunteer coordinator) and technical positions (urban foresters, arborists and ecologists). Volunteer opportunities were also created through the strategy, notably through the Citizen Forester programme and the Gardens for Wildlife programme.

Biodiversity and ecosystem benefits

The city's urban forest comprises around 70,000 trees in streets and parks as well as approximately 20,000 trees located on private premises, in addition to a growing number of green roofs and walls across the municipality. There are over 388 different species of trees in the city.

The urban forest is also home to diverse animal species including the powerful owl, tawny frogmouth, kookaburra, kingfisher, possum, White's skink, grey-headed flying fox, striped legless lizard and blue-tongued lizard, Eltham Copper butterfly, and a variety of frogs and microbats. Waterways across the municipality are used by birds for nesting and habitat.

Description of co-benefits

- Capacity was developed among local stakeholders, including community members, local authorities, and local organizations.
- Combining grey infrastructure and NbS reduces the cost of grey infrastructure expenditure and improves the quality of the urban environment.
- Urban forests and associated ecosystem services will also yield benefits by attracting more people to live and work in, and visit, Melbourne.
- Urban forest benefits that can be quantified in monetary terms span a range of industries and disciplines including health, engineering, planning, sustainability, geology and real estate. These include:
 - * Reducing energy costs (increasing tree cover by 10% – or strategically planting about three shade trees per building lot – saves annual heating and cooling costs by an estimated \$50 to \$90 per dwelling.)
 - * Increase in property values
 - * Avoided costs of infrastructure damage and renewal
 - * Decrease in health costs
 - * Support for tourism, which is growing in importance for many cities, through increased green space

Key success factors and lessons learned

In assessing the progress achieved so far through the strategy, some historical and context-specific aspects of the city must be taken into account. These include the Millennium drought as well as current and future challenges that urban forests in the city will face, such as aging tree population, diminishing availability of water, climate change, urban heat island effect, and urban intensification.

Other key factors to consider when planning urban forest include pressures such as population growth, economic growth, expansion of urban boundaries, and densification to ensure that cities remain liveable.

The development of the urban forest is an area of public planning that the government need not address without support. Developers seeking a marketing edge for their properties understand that building green means not just structural design, but the entire development site and its relationship to its surroundings. Business partners were also powerful contributors to the expansion and success of urban forestry through financial support, planting and maintenance of trees on commercial property, and support of civic organizations involved in forestry. Over 700 residents have volunteered as Citizen Foresters to help with various activities including tree planting and nature promotion events – receiving specific training for each activity – and this contributed greatly to the programme’s success (City of Melbourne n.d.).¹ For instance, over 120 Citizen Foresters helped collect data on tree hollows in parks and streets from 2016 to 2022 to help inform the management of trees (City of Melbourne 2021).

Achieving funding stability ultimately depends on on-going public support to ensure the city remains committed to the programme. Much of this support hinges on communicating and disseminating information about the benefits of Melbourne’s urban forest in terms of reduced stormwater pollution, electricity saved, carbon and water savings from lower energy use in buildings, lower demands on power plants, biodiversity benefits, and temperature reductions in the city as a whole – not to mention the aesthetic enhancement and wide-ranging social and economic advantages.

¹ See also <https://participate.melbourne.vic.gov.au/citizenforester/data-collection-complete-itree-urban-forest-assessment-project>, <https://participate.melbourne.vic.gov.au/citizenforester/citizen-foresters-create-habitat-oasis>

Alignment with public policies

The Tree Policy (City of Melbourne 2021) became operational in 2021 and recognize that all public trees covered by this policy are: (a) protected from any activity, including development, events or other activity that impacts their health and/or longevity; (b) protected from infrastructure conflict; and (c) give a priority status when the city is considering an application that has the potential to impact a tree, prior to the approval of any permit wherever reasonably practical.

The policy has been used as the basis of advocating for our urban forest. It allowed five grant projects to be accepted under the Urban Forest Fund. The fund provides matched financial support for new greening projects in the private realm, including new green spaces, tree planting, biodiversity projects, vertical greening and green roofs.

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Authors

Kelly Hertzog (City of Melbourne), Giuliana Leslie (City of Melbourne) and Diego Portugal Del Pino

Creating jobs and combatting desertification through local technologies in Burkina Faso

At a glance

Activity description and type of NbS	Restoration of degraded lands through applying traditional restoration techniques
Societal challenge(s)	Insufficient arable land Continuous land degradation due to erosion and anthropogenic pressure Youth unemployment Lack of security in some localities
Partners (identifying main implementers and partners, if any)	International Labour Organization (ILO) Alliance Technique D'Assistance Au Développement (ATAD) Fédération nationale des groupements Naam (FNGN) Bureau d'études CGS
Financing (source, amount)	81,090,500 West African CFA franc (US\$125,293) Financed by Sweden
Time frame	May–October 2022
Geographical focus	Burkina Faso: the localities of Kaya in the Centre-Nord Region, Fada N'gourma in the Est Region, and Ouahigouya in the Nord Region
Biodiversity and ecosystem benefits	Regeneration and acceleration of vegetation cover regrowth and limitation of land erosion
Employment effects	Creation of 3 000 person-days of paid work for the local population
Target beneficiaries (# people reached) – employment beneficiaries	The project hired 300 local workers

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The project ultimately aims to benefit the entire population of the three localities (319,757 people; 2019 census) and support stakeholders carrying out restoration with information to facilitate planning and budgeting.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	SDGs: 1, 8, 13, 15

Description of context and rationale for interventions

The Sahel is one of the regions most impacted by desertification in the world. To combat desertification and restore degraded landscapes in the Sahel, the Great Green Wall (GGW) initiative was launched in 2007 by the African Union and is being implemented across 22 African countries.²

The restoration efforts require a multitude of strategies and approaches, one of which is the wider use of indigenous restoration techniques. While these techniques have been used in the region for many years, as land degrades faster due to climate change and other factors, they now need to be used much more widely, and in regions where they were traditionally not relevant. Also, due to conflict, poverty, and intense use of the land, local populations are not able to apply these techniques autonomously at the scale required.

To support the wider use of these techniques as part of the GGW initiative, the ILO's Employment Intensive Investment Programme initiated a project in Burkina Faso to demonstrate, document, and analyse traditional restoration techniques. The project has been implemented in two areas the localities of Kaya in the Centre-Nord Region, and Ouahigouya in the Northern Region. Both regions in the project face similar environmental and socio-economic challenges.

Like those in the rest of the country, the three regions' soils are subject to strong erosion caused by human activities, wind, and water run-off. There is not enough arable land for the population, and climate change is exacerbating land degradation. All these factors have led to a decline in soil fertility, and thus there is a need to restore the soil's productive potential.

² See <https://www.unccd.int/our-work/ggwi>

What is more, these areas are faced with security challenges and large influxes of internally displaced people (IDPs) in some communities. Many people have poor control of production techniques and difficulty accessing land and credit. The population in the three regions is mainly composed of young people, but due to the lack of employment opportunities and policies for development, youth unemployment has become an important issue. There is also a progressive disinterest among the youth in agro-silvo-pastoral activities.

In response to these challenges, the project is implementing traditional restoration techniques, including the demi-lune (half-moon), zai, diguette en pierres (stone dike), diguette en terre (earthen dike) and digue filtrante (filter dike). Through the construction of small-scale infrastructure works in sectors with high economic potential, which follows a labour-based and environment-friendly approach, the project can support youth employment and access to social services. The lessons drawn from the demonstration project will also help identify feasible approaches to a large-scale application of the techniques.

Objective

By creating local jobs through the application of local technologies to combat desertification in the Sahel, the project can support the GGW initiative and broader regional initiatives to combat desertification. Specifically, by demonstrating, documenting and analysing the implementation of these traditional restoration techniques, the project aims to draw lessons and to enable a wider application of these techniques in global initiatives.

On a local level, the project aims to:

- Create employment opportunities for youth and internally displaced persons (IDPs).
- Restore 42 ha of degraded land and increase exploitable areas in three localities.
- Stabilize the development and cohesion processes for/by communities living in the Sahel.

Description of intervention/activities

The project planned to use traditional techniques to restore 42 hectares of degraded land in Burkina Faso, as a demonstration for more widespread use of these techniques and their benefits. So far, the project has been

successfully implemented in Songodin, a village in the Centre-Nord Region, and Sambtenga and Bogoya, two villages in the Northern Region. The execution of the work is entrusted to Alliance Technique D'Assistance Au Développement (ATAD) and Fédération nationale des groupements Naam (FNGN), two locally established civil society organizations (CSO) with proven experience in green development.

The zai and demi lune techniques are both rainwater harvesting techniques used in the three villages (Partey et al. 2018). A zai is a miniature circular basin used to collect rainwater. Using a pickaxe, workers drill holes 25–30 cm in diameter and about 10–15 cm deep. They are staggered to better capture runoff. A demi lune is a semi-circular basin used to collect rainwater. The excavated material is placed downstream behind the semicircle. By making holes in the land and filling them with compost, the techniques can help retain nutrients and rainfall, thus making degraded land available again for cultivation. The project also planted 900 tree seedlings inside the zai.

The traditional techniques of diguette en pierres, diguette en terre and digue filtrante are also applied in the project, especially in Bogoya. These techniques aim to slow water run-off, replenish groundwater and reduce soil erosion. The labour productivity for the various activities was measured, and improvements in the planning and sequencing of activities were identified so as to optimize productivity.

Measures have been put in place to improve the working environment, including personal protective equipment (PPE), small-scale equipment, and boreholes at each site to provide drinking water and latrines.

Outcomes achieved

- The project has completed the construction of
- 1,580 demi-lunes on 5 ha in Songodin
- 215,910 zai on 16 ha in Songodin and Bogoya
- 1500 trees planted in Bogoya and Sambtenga
- 900 trees planted in Songodin
- 3 digues filtrantes (24 m long), 3 diguettes en pierres (200 m) and 4 diguettes en terre (500 m) in Sambtenga

The demonstration project also documented the key data in the application of five indigenous restoration techniques to fight desertification as a basis for a more extensive use of the techniques as part of the GGW initiative.

Employment effects

This demonstration project in Songodin, Sambtenga and Bogoya provided temporary job opportunities for local people and internally displaced persons (IDPs). They were paid on a task basis, according to the agreed output achieved on the sites' development sites. Before the start of each project, the workers received training to strengthen their technical capacities for carrying out the work. The project in the three localities is expected to create employment of 3,000 person-days in total.

So far, 300 workers were recruited for the work in two localities, of which:

- 210 were female
- 64 were IDPs
- 71 were young people (age between 18 and 30)

The employment effects of the restoration techniques were also documented and analysed.

Biodiversity and ecosystem benefits

The traditional techniques of demi-lunes, zai, stone bunds, earth bunds, and permeable rock dams can help restore fertility and conserve water in the soil. As indigenous land conservation methods, they are expected to reduce soil erosion and vegetation loss, thus enhancing the ecosystems. They can reactivate biological activities in the soil, and thus improve the soil structure. The restoration will also make more arable land available, helping relieve human pressure on the environment and halt degradation.

Description of co-benefits

Farmers will benefit from capacity-building opportunities on land restoration techniques to continue improving land productivity and better incomes. Beyond the sites dedicated to the project, participants began to apply the techniques learned or optimized in their family plantation.

As the degraded land is restored and becomes available for cultivation, the anthropogenic pressure on land will be better addressed.

The demonstration and analysis of traditional restoration techniques can facilitate their application on a large scale, as part of the GGW.

Moreover, restoration can help increase yields, benefiting the local people. In the village of Pintiagou in the Est Region, the project's construction of zai and diguettes en pierres is expected to improve land productivity by about 0.400t/ha (from the current 0.6t/ha to 0.9 or 1t/ha) for crops such as white sorghum and small millet.

Key success factors and lessons learned

Lessons learned:

- The schedule of activities needs to be adjusted based on availability of labour.
- A monitoring strategy that integrates safety aspects for the project team, beneficiaries, and service providers is needed, especially in areas with volatile security.
- A preparatory phase of the project that integrates the production of compost based on organic manure is essential to ensure its availability.
- Workers' productivity improved with the availability of drinking water and a rest area for women to care for young children.
- It is important to measure several social indicators at the beginning of the project, for a better understanding of group dynamics and social cohesion.

Reference

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Authors

Yuli Chen (ILO), Frédéric Bandon Mboyong (ILO)

Grain for Green (aka Sloping Land Conversion Program) in China

Summary: Grain for Green (aka Sloping Land Conversion Program) in China

In the 1990s, extensive land clearing led to increased soil erosion, frequent droughts and floods, and ecosystem degradation in many areas in China. After severe floods in 1998 claimed over 3,000 people's lives, the Chinese government recognized nature as a critical solution for disaster risk management, economic and social development, and ecosystem degradation. In 1999, it launched the Grain for Green (GfG) programme, one of the largest restoration programmes in the world.¹ Still ongoing, GfG seeks to reduce soil erosion, enhance biodiversity, and conserve natural resources by converting steep-sloped land, degraded cropland and barren land into forest and grassland (Lieuw-Kie-Song and Pérez-Cirera 2020). The programme also aims to accelerate the economy's transition towards sustainability while improving farmers' incomes.

GfG incentivizes farmers to stop activities that cause ecosystem degradation and instead plant trees or grass to restore ecosystems. This is mainly implemented in ecologically important or vulnerable area, or those with serious soil erosion, desertification, or low and unstable yields. Participating households receive a subsidy if their restoration efforts meet government requirements for specific trees species, plantation density, and survival rates, among others. The labour needed to meet these requirements is an estimated 30–60 person-days per household per year, on average.

Between 1999 and 2019, 41 million households participated in the programme. Each participating household received a total of 9,000 yuan (CNY, about US\$1,300) on average (NFGA 2020). In return, these households collectively provided over 36 million full-time equivalent years of labour input over this period. As payments are made in three tranches over the five-year period,

¹ Ecosystem restoration means preventing, halting and reversing the degradation of ecosystems worldwide to regain their ecological functionality and improve productivity and capacity to meet the needs of society. (BMUV and IUCN n.d.; see also the Restoration Barometer case in Part B of this appendix).

many farmers formed cooperatives to implement the restoration work, so as to receive more frequent payments. By 2021, China had 23,000 forestation cooperatives in 22 provinces, creating job opportunities for 1.6 million poor people and increasing their annual per capita income by more than CNY3,000 (US\$435).

Between 1999 and 2019, 34.3 million hectares of farmland was converted to forest or grassland, greatly benefitting the ecosystem by reducing soil erosion, conserving water, sequestering carbon, and preventing desertification. The annual total ecological benefit is estimated at CNY1.48 trillion (US\$220 billion).

Key to the success of GfG are the subsidies and other policy supports to incentivize local governments and farmers to participate in restoration. However, long-term measures are needed to ensure farmers' livelihoods after the subsidy period through the creation of green jobs and capacity building. Planting of 'ecological' indigenous trees rather than the 'commercial' species preferred by farmers would ensure the programme followed NbS standards more closely.

At a glance

Activity description and type of NbS	restoration; conversion of farmland to forest and grassland; sustainable forest management
Societal challenge(s)	Reduce the risks of disasters caused by vegetation loss and soil erosion, especially floods. Transition the rural economy towards sustainability and increase farmers' incomes.
Partners (identifying main implementers and partners, if any)	National Forestry and Grassland Administration National Development and Reform Commission Ministry of Finance Ministry of Agriculture Ministry of Land and Resources Provincial, city-level, and county-level governments
Financing (source, amount)	The central government invested CNY517.4 billion (US\$76.57 billion) in the programme from 1999 to 2019.
Timeframe	1999–present
Geographical focus	China. Areas with serious soil erosion, desertification, low and unstable yield, and ecologically important or vulnerable (including deep sloping land)

Biodiversity & ecosystem benefits	From 1999 to the end of 2019, 515 million mu (34.3 million hectares) of farmland were restored to forest and grassland. Each year, the programme helps conserve 38.523 billion cubic metres of water, fix 634 million tonnes of soil, sequester 49 million tonnes of carbon, release 117 million tonnes of oxygen, absorb 3.1483 million tonnes of pollutants, retain 476 million tonnes of soil, and prevent wind and sand erosion. The annual total ecological benefit is estimated at CNY1.48 trillion (220 billion USD).
Employment effects	Creation of job opportunities, especially in forestry
Target beneficiaries (# people reached) – employment beneficiaries	By the end of 2019, 41 million farming households with 158 million people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	China's National Plan on Implementation of the 2030 Agenda for Sustainable Development, under the action plan for SDG 15 Life on Land (Ministry of Foreign Affairs of the People's Republic of China 2016) NDCs: By 2030, China promised to increase forest stock volume by 6 billion cubic meters from the 2005 level (China 2021) China's National Biodiversity Conservation Strategy and Action Plan (2011–2030) (Ministry of Environmental Protection 2011)

Description of context and rationale for interventions

China has a large agricultural sector. Population pressures and agricultural development have resulted in many forests, grasslands and wetlands being converted to other uses, notably farmlands. **Extensive land clearing has led to increased soil erosion, frequent droughts and floods, and ecosystem degradation.** In the late 1990s, 37.1% of the country's land area was affected by soil erosion. Two billion tons of silt were lost annually from the watersheds of the Yangtze and Yellow Rivers alone (National Forestry and Grassland Administration (NFGA) 2020).

Environmental degradation made the land more vulnerable to disasters. In 1998, a series of floods in the Yangtze River and other rivers in China claimed the lives of over 3,000 people and caused an economic loss of 255 billion yuan (CNY, around US\$31 billion) (NFGA 2020). In light of the widespread devastation, the Chinese government recognized **nature as a critical solution** for disaster risk management, economic and social development, and ecosystem degradation. To restore the forests and watersheds, China banned logging several regions. To support the forestry workers laid off due

to the ban and restriction, China implemented a series of social protection measures.

The support measures for other rural households affected by the restoration were incorporated in the Grain for Green (GfG) programme. The GfG programme is also called the “Returning of Farmland to Forest and Grassland” or “Sloping Lands Conversion Programme”.

Since 1999, the programme has evolved to have a stronger bottom-up approach, taking farmers' willingness as a precondition for implementation. It has also shifted focus to a long-term rural economic transition, rather than short-term compensations for income loss (Forestry administration of Guangdong Province 2014).

Objective

The programme seeks to reduce soil erosion, enhance biodiversity, and conserve natural resources by converting steep-sloped land, degraded cropland, and barren land into forest and grassland (Lieuw-Kie-Song and Pérez-Cirera 2020). In the long term, the programme also aims to facilitate the transition in the agricultural economy towards sustainability, while also improving farmers' incomes (Xu and Cao 2002).

Description of Intervention / activities

The main intervention is **to plant trees or grass on the land to restore vegetation while halting agricultural activities that might lead to ecosystem degradation**. The programme is mainly implemented in areas with serious soil erosion, desertification, low and unstable yields, and of ecological importance or vulnerability (including deep sloping land). Households participating in the conversion of farmland to forest or grassland can receive a subsidy.

The subsidy was originally in the form of grain, which explains the name of the programme. This was changed into a cash subsidy in 2004. To get the subsidy, participating farmers on behalf of the household must sign a **contract** with the county-level government, specifying: (1) the scope and location of the farmland to convert; (2) the method of conversion; (3) the expected survival rate and preserving rate of the forest; and (4) other management work. Only when farmers' work on reforestation meets the conditions specified in the contract can they receive the subsidies.

It is noteworthy that the GfG has made an important shift in 2014. At the programme's beginning, at least 80% of the afforested land had to be planted with ecological trees (trees with a primary purpose of restoring environmental

functions, particularly controlling soil erosion and desertification). Only 20% of the afforested land could be planted with commercial trees that provide marketable products, such as walnut (Zinda et al. 2017). In 2014, however, these restrictions were lifted. Currently the specialists assigned by the county-level forestry authorities decide on tree species and other technical requirements for the land to be converted, based on economic feasibility, ecological conditions, and farmers' input (NFGA 2013). This is partly because commercial trees are considered to have similar environmental value as ecological ones (Zhou 2014).

Farmers **can farm in the areas converted to forest or grassland**, on the condition of not damaging vegetation or causing new soil erosion. For instance, participating farmers can plant dwarf crops such as beans, peanuts and vegetables, to develop a non-timber forest-based economy. After the farmers receive all their subsidies from the government, they are also allowed to harvest timber from the forest with government approval. Farmers can use the grass as feed for livestock, but grazing is prohibited.

At present, the national standard of conversion from farmland to forest is CNY1,600 (US\$237) in total per mu (a Chinese unit of area, equal to 1/15 of a hectare or 667 square meters). This includes a cash subsidy of CNY1,200 (US\$177) and a seedling subsidy of CNY400 (US\$59). The CNY1,200 subsidy will be distributed after five years: CNY500 per mu in the first year, CNY300 yuan per mu in the third year, and CNY400 per mu in the fifth year. The seedling planting subsidy should be used for seedling procurement and plantation management. The subsidy for conversion from farmland to grassland is CNY1,000 (US\$148) per mu. Each province can add more subsidies based on the national standard. For example, Shanxi province started in 2016 to provide an extra subsidy of CNY800 (US\$117) per mu for households participating in the reforestation in poor counties, and CNY500 (US\$73) per mu for those in other counties (Fan and Jing 2016).

The subsidies are also meant to cover the labour input provided by households. On average the total labour needed for a farmer to meet the requirements of the CfG programme in forestation ranges from 12 to 25 working days per mu over 5 years. Thus, the average farming household (having 12.5 mu of land) in the programme can expect to work about 30–63 days a year on restoration activities. The CNY1,200 cash payment per mu equates to about CNY48–100 per day (US\$6.2–13.8) (Institute of Urban Environment, Chinese Academy of Social Sciences 2010).² This compares well with the daily wages of CNY80–150

² On average, forestation (including land clearing, preparation, planting, and nurturing, excluding maintenance) of land per hectare requires 103.5 days (6.9 days/mu) of work by one

per day (US\$11.6 to 21.8) (Hu and Qiao 2018), given that the work is done close to home and at the household's convenience.

Since 2016, the GfG programme has focused more on poor counties and households (Ministry of Finance et al. 2016). Notably, Shanxi province developed a "Poverty Reduction and Forestation Cooperative" model. The cooperatives create job opportunities for members by undertaking the GfG and other forest management projects. In this way, members can receive regular wage payments, rather than only three payments over the five-year period. In some successful cooperatives, the forestation workers' annual wages can be over CNY15,000 (US\$2,175) per person (Shi 2019). The cooperatives prioritize members' labour incomes, as labour costs must account for more than 45% of the total project budget (General Office of the People's Government of Shanxi Province 2017). By 2021, there were 23,000 forestation cooperatives in 22 provinces, creating job opportunities for 1.6 million poor people and increasing their annual per capita income by more than CNY3,000 (US\$435). Most of the cooperative forestation workers are over 50 years old.

Outcomes achieved

The GfG programme helped restore degraded ecosystems by increasing vegetation cover. The 25 provinces participating in the programme have increased their forest cover by 4% on average, effectively halting the desertification in the north and southwest. Soil erosion around the Yangtze River, Yellow River and other major rivers was also significantly reduced.

Employment effects

Employment:

- By the end of 2019, 41 million households participated in the GfG program nationwide (NFGA 2020).
- The program is estimated to have generated 9,528 million days of work, equalling 38 million FTEs, for land clearing, preparation, planting, nurturing and maintenance (NFGA 2021).

person. The maintenance within five years after the forestation requires 80 to 270 working days per hectare (5.3 – 18 days/mu).

Income:

- Each participating household received on average a total of CNY9,000 (US\$1,313.72) from 1999 to 2019 (NFGA 2020).
- The programme diversified participating households' income sources.

Biodiversity and ecosystem benefits

From 1999 to the end of 2019, 515 million mu (34.3 million hectares) of farmland were converted to forest and grassland (NFGA 2020).

Each year, the programme helps conserve 38.52 billion cubic metres of water, fix 634 million tonnes of soil, sequester 49 million tonnes of carbon, release 117 million tonnes of oxygen, absorb 3.1483 million tonnes of pollutants, and retain 476 million tonnes of soil. These ecological benefits are estimated to be worth CNY1.48 trillion (US\$220 billion) per year, equalling 2.7 times of the total investment of 20 years (1999 to 2019) in the programme (NFGA 2021a). In addition to these benefits, the programme also contributed to biodiversity by restoring habitats.

Key success factors and lessons learned

- Subsidies and other policy support have greatly incentivized local governments and farmers to participate in restoration, as the subsidy standard is in accordance with the average forestation wages and the labour needed for restoration.
- The programme seeks to balance both economic and ecological aspects by allowing both local governments and farmers to select the trees/grass and methods used in the conversion.
- Long-term measures to ensure farmers' livelihoods after the subsidy period are necessary. It is important to develop sustainable forest management, create green jobs and build capacity among farmers for such opportunities.
- There is a divergence of interests between the ecological and economic sides, notably in the type of trees used in the conversion. Farmers tend to plant 'commercial trees' such as walnut, which provide marketable products, instead of 'ecological trees' without such output. This change reduces the extent to which the programme follows NbS standards if only non-indigenous trees are planted.

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Author

Yuli Chen (ILO)

Restoring strategic ecosystems for watershed protection and conservation in Colombia

At a glance

Activity description and type of NbS	Ecosystem restoration
Societal challenge(s)	Erosion and deforestation are two of the main causes of water scarcity in the country. Goal is to contribute to water protection and security in the territories where Grupo Argos (GA) and its strategy businesses (Cementos Argos, Celsia, Odinsa) has presence.
Partners (identifying main implementers and partners, if any)	Colombian Ministry of Environment States and local governments States and regional environmental authorities (Cornare, Corantioquia, CVC, Cortolima) NGOs (Fundación Natura, Wildlife Conservation Society Fundación Guayacanal, Instituto Von Humboldt, Proantioquia, among others.) Community social boards Local communities
Financing (source, amount)	Total funding US\$9,966,360, with US\$2 947.560 provided by Grupo Argos Foundation and US\$7 018.800 provided by Celsia.
Time frame	2016–2021. The programme goals are established until 2030.
Geographical focus	Colombia, in the states of Antioquia, Bolívar, Córdoba Sucre, Tolima and Valle del Cauca
Biodiversity and ecosystem benefits	9 537 hectares restored and conserved 11 412.393 native trees planted
Employment effects	7 211 jobs (66% direct and 34% indirect)

Target beneficiaries (# people reached) – employment beneficiaries	7 211 people (71% men and 29% women)
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	77 837 people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	SDGs: 1 No poverty, 5 Gender equality, 6 Clean water and sanitation, 13 Climate action, 14 Life below water, 15 Life on land, and 17 Partnerships for the goals. Colombia Long -term Climate Strategy E2050 – Goal 2 Integral Management of Biodiversity and Ecosystem Services. Nationally Determined Contribution: The initiative contributes to the national goals established in the Colombian NDC, especially to increase the area under ecological restoration by 18,000 ha, the recovery of protected areas and vulnerable zones, and to launch six initiatives on climate adaptation and sustainable management of mangroves (Colombia, Ministry of Environment and Sustainable Development 2020) It also contributes to the goal of the Colombian Government to plant 180 million trees (native species).

Description of context and rationale for interventions

Colombia is well known for its biodiversity. It has a land area of 1,141,748 km²; of these, natural forests cover 60,025,731 hectares (ha). Among its strategic ecosystems are glaciers (36.7 km²), moorlands (2,254,444 ha), wetlands (30,781,149 ha) and dry forests (330,545 ha) (Colombia, Ministry of Environment and Sustainable Development 2020).

According to the Colombian Ministry of Environment, 40% of the national territory has some degree of erosion, 3% is severely eroded, 158.894 hectares have been deforested, and 56% of the regions are highly threatened by climate change. Consequently, erosion and deforestation have become two of the main causes of water scarcity in the country.

Since 2016, Grupo Argos and its business partners have been working since 2016 to restore strategic ecosystems – including mangroves, tropical dry forests and Andean forests – to contribute the fight against climate change and improve water protection and security in the Colombian territories where the group has its operations.

Grupo Argos, as a business group, seeks to protect water from its source in the mountains to where it flows into the sea using a systemic analysis

methodology with a social and ecological approach, that considers water, biodiversity and social impact as the main variables.

Specifically, the initiative takes place in states of Colombia (Antioquia, Bolívar, Córdoba, Sucre, Tolima, and Valle del Cauca) and covers strategic ecosystems such as mangroves, tropical dry forests, and Andean forests.

Objective

This programme aims to help restore, protect and conserve key strategic ecosystems for the country's water regulation and to contribute to the fight against climate change through the conservation of biological corridors, the protection of endangered species and the generation of green jobs.

Description of intervention/activities

Four components have been considered for the implementation of the program, in which actions are developed for conservation and social transformation to protect water resources and the health of the ecosystems, and to improve the quality of life for communities.

- Component 1: Ecological and forest restoration and investigation.
 - * Identification of lands according to the importance of water resources
 - * Tree planting process and formation of community nurseries
 - * Signing of restoration agreements with landowners
 - * Follow-up and maintenance of trees planting
 - * Definition of species and monitoring of indicators
- Component 2: Community participation and creation of green jobs
 - * Open calls to landowners to participate in the restoration process
 - * Capacity-building with local communities and landowners in ecosystem restoration and conservation techniques, as well as in the protection of water resources.
 - * Strengthening of community nurseries with technical support
 - * Generation of local employment
 - * Partnerships with public and private organizations to promote the programme

- Component 3: Environmental education and participatory monitoring process
 - * Development of an environmental education programme in rural schools to improve environmental good practices
 - * Participatory research and monitoring of species with communities
- Component 4: Alternative solutions to access to safe water for communities
 - * Donation of alternative solutions to access to safe water to families and schools
 - * Monitoring of water quality
 - * Identification of innovative solutions to access to safe water

Outcomes achieved

By taking a holistic approach in its water conservation and protection strategy, the initiative has improved the well-being of communities while contributing to the restoration of ecosystems. The protection of watersheds brings benefits in every aspect to community livelihoods. A good supply of water also improves areas such as health, education and farming productivity, among others.

In this way, the programme has achieved not only the ecological restoration of the prioritized areas but has also assured that beneficiaries can improve their agricultural and livestock practices, their access to environmental education and access to drinking water; in addition communities were able to participate in monitoring of wildlife species and the creation of new green businesses. For example, community nurseries became part of the restoration supply chain by selling plants to the foundation and its partners.

Three community associations of the Colombian Caribbean Coast established their own nurseries, employing more than 30 people. These organizations received technical training and financial support from Grupo Argos Foundation to improve their knowledge on the protection, management, and restoration of mangrove ecosystems. Currently, they supply seeds, plants and services such as the planting and maintenance of these trees to environmental authorities, companies, and foundations. To date, they have planted more than 270,000 mangrove trees, receiving around US\$184,000 in payments. In this way, organizations have received economic, social and environmental benefits from the restoration programmes in their territories.

Outcomes:

- 9,537 hectares restored and conserved
- 11,412.393 native trees planted
- 121 conservation agreements signed with landowners and smallholder farmers
- 68,000 students trained through the environmental programme
- 9,716 people benefiting from safe water solutions

Employment effects

The programme generated direct and indirect jobs for 7,211 people in different activities, such as the restoration, protection and management of forests and strengthening of local nurseries. Most of the people are from rural areas of six Colombian states (Valle del Cauca, Tolima, Antioquia, Córdoba, Sucre, and Bolívar). The programme also promoted environmental projects from the communities that aim to develop their territories and generate income for families.

Monitoring of the number of both direct and indirect jobs created by the programme began in 2021, as shown in the table. Of the total number of jobs created, 66% were direct (hired by GA and its companies) and 34% were indirect jobs (i.e., relating to supplementary activities to the programme). In terms of gender balance, 79% of those employed were men and 21% were women. The number of jobs generated per year are described in the table.

YEAR	NO. JOBS	DIRECT	INDIRECT	MEN	WOMEN
2016	419	-	-	-	-
2017	976	-	-	-	-
2018	1 020	-	-	814	206
2019	1 175	-	-	938	237
2020	1 058	-	-	845	213
2021	2 563	1 681	882	2 006	557
Total	7 211				

Biodiversity and ecosystem benefits

The initiative has relevant results for the conservation of biodiversity. The most tangible is the number of hectares restored (9,537 ha) and the number of native trees planted (11,412,393).

In addition, the results of the participatory monitoring process of species in 2021 resulted in 2,393 wildlife records identified by camera traps. These activities have also contributed to harmonizing the relationship of communities with threatened umbrella species, such as the Andean Bear, as they encouraged the protection of the species' habitats through conservation agreements with landowners and smallholders.

Description of co-benefits

- Agricultural producers in the territories received technical assistance to develop more sustainable practices (for example, technical training in regenerative livestock), which has increased productivity.
- The increase in the participation of vulnerable communities, such as women and youth, in the participatory monitoring of species and environmental education activities has generated new community initiatives (e.g., the creation of community tree nurseries).
- Technical and financial support to community organizations for the implementation of environmental and agricultural projects have contributed to the reduction of economic and environmental vulnerability in the territories.
- The creation of a special brand of coffee, Andean Bear Coffee, enabled the community to allocate part of its profits to the conservation of this species' habitat.
- The environmental education programme enabled teachers and students to understand the ecosystems where they live and to create new practices to protect them.

Key success factors and lessons learned

One of the key success factors of the programme is the work done with the communities. Since the beginning, the initiative was co-designed with the community leaders and organizations, as they understand the impact of the restoration programme at all levels (economic, environmental and social). This has allowed Grupo Argos and its businesses to identify the needs of each territory and to adapt the programme accordingly.

One of the lessons learned is the need to establish appropriate methodologies to evaluate the success of the reforestation activities and assess their impact. Creating partnerships with the academia and research entities is key to this part of the process.

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Payment for Environmental Services in Costa Rica

At a glance

Activity description and type of NbS	Protection, restoration and sustainable management of forests
Societal challenge(s)	High deforestation rates, with associated land degradation and biodiversity loss
Partners (identifying main implementers and partners, if any)	National Forest Financing Fund (FONAFIFO)
Financing (source, amount)	Government funding: more than US\$565 million from 1997 to 2021 Other sources of funding include the private sector, international banks and bilateral agencies (Porrás et al. 2013).
Timeframe	1997–present
Geographical focus	Private land (Porrás et al. 2013)
Biodiversity and ecosystem benefits	Contributed to the recovery and maintenance of forest cover, as well as restoration of ecosystems (333 000 ha managed annually)
Employment effects	Approximately 3 500–4 000 direct jobs/year generated
Target beneficiaries (# people reached) – employment beneficiaries	19,184 contracts signed with small- and medium-sized farm owners
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	SDGs: 8 – Decent work and economic growth, 12 – Responsible consumption and production, 13 – Climate Action, and 15 – Life on Land. Costa Rica National Biodiversity Strategy and Action Plan (2017)

Description of the context and justification of the interventions

During the 1970s and 1980s, Costa Rica experienced one of the highest deforestation rates in the world. By 1995, forests covered only 25% of the national territory. To address this problem, the country viewed natural resources as a path to development and developed a robust and innovative regulatory framework that incorporates the recognition of environmental services provided by forests and forest plantations for the benefit of Costa Rican society. As a result, Costa Rica is the only tropical country in the world to have reversed deforestation (World Bank 2022), with 52.4% of its territory now covered by forest.

The Forest Law No. 7575 of 1996 included relevant measures to support the recovery of the country's forest cover. These included the prohibition of changes in land use, the concept of environmental services, the creation of the National Forest Financing Fund (FONAFIFO) as the executing entity of the Payment for Environmental Services Program (PESP). It also established the programme's source of financing, which is based on a percentage of the single tax on fossil fuels collected under the “polluter pays” principle.

The PESP scheme consists of four pillars (FONAFIFO. n.d) that have enabled its development and operation, as well as its capacity to adapt to changes over time: (a) a defined legal framework; (b) permanent financing from national sources; (c) governance of the programme with responsibilities and competencies defined for the actors involved; and (d) a monitoring and follow-up system for the execution of actions on the ground. These pillars have contributed to the proper management of public funds and the successful implementation of the programme throughout changes in government.

The development and implementation of financial mechanisms for the conservation of forests generated initiatives such as Ecomercados I and II with the World Bank, the Huetar Norte Forestry Project supported by the Government of Germany, and the project for the sale of Certified Emission Reduction (CER) credits under the Clean Development Mechanism of the United Nations Framework Convention on Climate Change (UNFCCC). These programmes have been pivotal for the country's National Strategy on REDD+ (reducing emissions from deforestation and forest degradation, and enhancement of forest carbon stocks) and the positioning of Costa Rica as a global environmental leader, as well as to promote commercial agreements with the Green Climate Fund, the Forest Carbon Partnership Facility (FCPF) of the World Bank and, more recently, negotiations with the Lowering Emissions by Accelerating Forest finance (LEAF) Coalition.

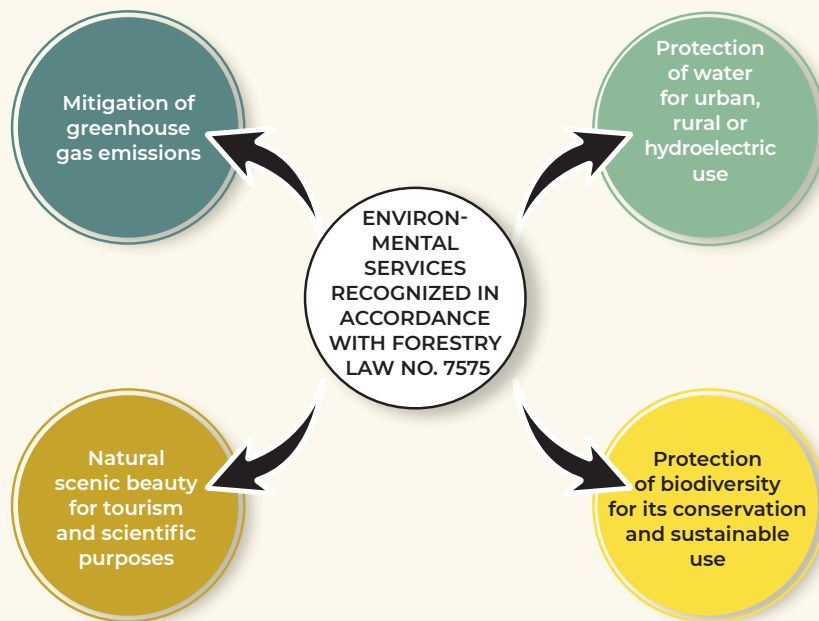
Global recognition of Costa Rica's efforts materialized with the designation of the PESP in 2020 by the United Nations as a Global Climate Action. In 2021, the country was awarded the first Earthshot Prize in the category of Protection and Restoration of Nature for the actions of the PESP and the country's National System of Conservation Areas.

Goal

The PESP recognizes, through a payment to small- and medium-size producers, the environmental services provided by forests and forest plantations.

The PESP aims to ensure the provision of four main ecosystem services: capturing and storing atmospheric carbon, protecting water sources, and conserving biodiversity and scenic beauty (see figure) (Porras et al. 2013).

Figure: Environmental services recognized within the PESP



Source: FONAFIFO

Description of the intervention/activities

The financing of the PESP through taxation represented a way for Costa Rican society to support the recovery and maintenance of forests on private land, while complementing the actions of the State concentrated in Protected Wildlife Areas. Any private landowner with a property title or possession rights for a minimum of one hectare can access the PESP. The four main categories of participants are: individuals, legal entities (including micro-enterprises, family businesses, small- and medium-sized enterprises, and large companies and their subsidiaries), development or conservation cooperatives, and Indigenous communities (Porrás et al. 2013).

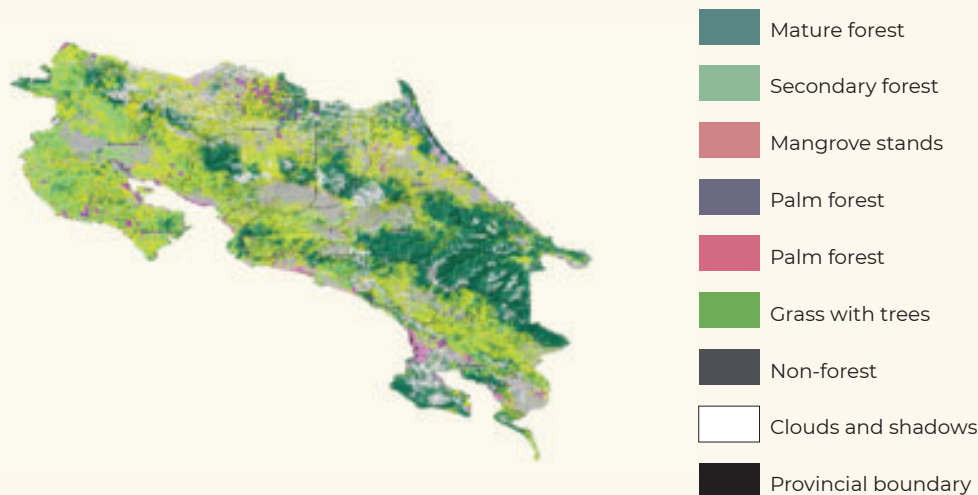
This mechanism consists of payments to the owners of private farms for the environmental services generated by their work in maintaining forest coverage (including protection of water resources and post-harvest protection) and restoring forests (including reforestation, regeneration and agroforestry systems).

In particular, the introduction agroforestry contracts significantly incentivized small-scale farmers (with less than 10 hectares) to participate in the PESP. The contracts, which are based on the number of trees rather than hectares, resulted in 4.4 million trees being planted between 2003 and 2013 (Porrás et al. 2013). Beneficiaries must meet a series of general and specific requirements (a minimum and maximum limit of hectares and trees, depending on the activity). The duration of the contract varies from 5 to 10 years, during which time implementation and maintenance work is carried out by both the farmers and hired labour (i.e., earning agricultural wages). Aside from direct payments, private forest owners who manage the forests through PESP are exempt from property taxes (Porrás et al. 2013).

Outcomes achieved

This financial mechanism, together with other initiatives and public policies, has contributed to the doubling of the country's forest area from 25% in 1995 to 52.4% in 2015 (see figure of map).

Figure: Map of Costa Rica forest cover



Source: National Forest Inventory 2015.

Effects on employment

Between 1997 and 2021, the Costa Rican Government invested more than US\$565 million in rural areas of the country through the PESP (including more than US\$40 million in Indigenous territories), thus supporting income generation, employment and conservation on private farms, as well as supporting policies of the Ministry of Environment and Energy (MINA E) on establishing biological corridors, biodiversity and protection of water resources. The PESP is a major source of income for many Indigenous communities and has improved quality of life for families (Porrás et al. 2013; UNFCCC n.d.).

Throughout its 25 years of operation, the PESP has signed 19,184 contracts of between 5 and 10 years with small- and medium-sized farm owners, supporting the protection of 1.3 million hectares of forests. The participation of women and Indigenous peoples has been central to the achievement of these results. The programme has led to the creation of 3,500–4,000 direct jobs each year generated by the demand for labour to implement and manage its activities. According to a 2003 survey, job creation under the PEST is variable, mostly resulting in occasional work (once a year for 2–4 weeks). Apart from the forestry activities carried out by family members and/or farm

workers, the PESP also directly created technical and professional posts such as forest engineers, geographers, and biologists in related organizations (Miranda, Porras and Moreno 2003).

However, while legal entities are the most prominent group receiving distributions of payment for reforestation, their right to anonymity makes it difficult to measure the employment effects they generate in any detail. The PESP might also have potential negative impacts on jobs, if forest protection leads to the abandonment of agricultural lands (Porras et al. 2013).

Benefits for biodiversity and ecosystems

PESP has contributed to the recovery and maintenance of forest cover and to the restoration of ecosystems throughout the country, with 333,000 hectares managed annually, thereby improving the provision of environmental services.

Success factors and lessons learned

Among the main strengths of the PESP is the degree of professionalism of its human capital, which has enabled it to maintain and improve the programme through innovation in creating and exploring new schemes and sources of financing. Another success factor is represented by the capacity to develop business opportunities with companies – both public and private, and national and international – with the institutional objective of benefiting the owners of forests, forest plantations and the country's forestry and environmental sector in general. Actions by private forestry professionals and the contributions of grassroots organizations that provide technical and administrative advice to farm owners, along with international cooperation, have led to proactive efforts to identify alternatives that would financially strengthen the PESP.

There is a need for the PESP to evolve in order to respond to emerging needs and urgent priorities. Current discussions are focusing on the implementation of a new programme called "PES 2.0", which will aim to address actions beyond the country's forestry sector.

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Authors

Gilmar Navarrete Chacón, Director of Environmental Services, FONAFIFO

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Pavel Rivera, Economics Specialist, IUCN-ORMACC

Improving coastal resilience and livelihoods in Kenya

At a glance

Activity description and type of NbS	Restoration: Mangrove forest restoration, creating natural carbon sinks for climate change mitigation, and protecting shorelines from coastal erosion and loss of marine biodiversity Promotion of sustainable environmental practices and effective waste management with the aim to reduce the amount of plastic waste along the Kenyan coastline, which impacts negatively on coastal and marine biodiversity and sustainable livelihoods Protection: Enhancement of sustainable mangrove conservation Sustainable management: Women's economic empowerment through training and support of coastal communities in female-led sustainable seaweed farming cooperatives
Societal challenge(s)	poverty gender inequality and gender-based violence climate-related risks
Partners (identifying main implementers and partners, if any)	NGO: Plan International Kenya and Plan International UK Government: Kenya Marine and Fisheries Research Institute (KMFRRI); Kenya Forest Service (KFS) Community-based organizations: Beach Management Units; Pwani University
Financing (source, amount)	£320k; Moondance Foundation
Timeframe	3 years (2020–2023)
Geographical focus	coastal Kwale county, Kenya
Biodiversity and ecosystem benefits	The project has contributed to improving the restoration of local mangrove forests and enhancing fish populations through the conservation of existing mangroves, while also rehabilitating degraded sites.

Employment effects	The project has contributed to job creation through the establishment of seaweed farming groups and community mangrove restoration groups, which are also involved in the establishment of a commercial mangrove seedling mangrove nursery.
Target beneficiaries (# people reached) – employment beneficiaries	3 780 adults and children living in 5 coastal communities
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	7 500 more people benefitted indirectly
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Kenya's Updated Nationally Determined Contributions submitted on 24 December 2020: progress towards achieving a tree cover of at least 10% of the land area of Kenya; scaling up NbS for mitigation (Kenya Ministry of the Environment and Forestry 2020). <i>NATIONAL CLIMATE CHANGE ACTION PLAN (NCCAP) 2018–2022</i> – Strategic Objective 3: Enhance the resilience of the Blue Economy and Water sector; Action 6: Improve resilience of coastal communities – Rehabilitating and restoring mangrove forests; and Strategic Objective 4: Increase forest/tree cover to 10% of total land area; Action 1: Afforest and reforest degraded and deforested areas in Counties – Expansion and protection of mangrove forest cover (Kenya Climate Change Action Plan n.d.).

Description of context and rationale for interventions

Along the Kenyan coastline, 71 per cent of the population live in poverty, and communities are highly reliant on natural resources to survive. The coastal ecosystem, a diverse mix of mangroves, seaweed beds and coral reefs, is extremely important ecologically. It also has enormous potential to support local communities with sustainable and resilient livelihoods, if managed well.

However, in recent years the degradation of mangrove forests, primarily for firewood, as well as over-fishing have become prevalent as means of short-term income for the coastal communities. This undermines the ecological balance of the local ecosystem and impacts negatively on the future economic security of these communities, while making them more vulnerable to the effects of climate change such as storm surges and flash floods. Women and children are often the most vulnerable, as they generally have limited access to resources, services and information, and lack the mobility to act in anticipation of and response to climate and weather risks. This economic and social vulnerability has been further exacerbated by the COVID-19 pandemic,

as the lack of savings or social security contribute to coastal communities' concerns about their future earning potential in a potential economic crisis.

Additionally, Kwale County has experienced extended periods of drought, leading it to be included among the 18 counties in Kenya that rely on relief food and other humanitarian responses . The communities depend on rainfed agriculture and fishing as main sources of livelihood. However, the county has been experiencing a cycle of failed rains over the last three years. Overfishing, increased sea temperatures and environmental degradation has resulted in decreasing fish catch and limited alternative sources of livelihood. Families are finding it difficult to cope, and conditions have worsened with increased food insecurity and other economic challenges, poverty, climate and weather extremes, the spread of diseases and the lack of social protection mechanisms. Communities within the project sites were previously reliant on fish farming and subsistence crop farming for their daily needs, but as challenges compounded, they have become exposed to chronic food shortages leading to an increased risk of malnutrition, reductions in school enrolment and increase in gender-based violence.

The Coastal Resilient Livelihood Project has been working with communities to promote alternative and supplemental environmentally sustainable and climate resilient income-generating opportunities, primarily targeting women. The initiative aims to promote community-led environmental protection and management, while increasing awareness of environmental issues and climate change. In particular, the project aims to empower women and children to promote environmental stewardship by taking a leading role in mangrove forest restoration within their communities, leading to an increase in biodiversity and natural carbon sinks, as well as the promotion of breeding sites for fish and increased protection from storm surges and coastal floods. Seaweed farming provides an opportunity to increase the climate resilience of coastal communities, improve women's economic empowerment, food, energy and shelter for marine life, and promote carbon sequestration and coastal protection.

Objective

Objective: Improved well-being of target communities and households in coastal Kwale County, Kenya, through the sustainable management and conservation of natural resources. This is to be achieved through the realization of the following outcomes:

1. Community-led mangrove forest restoration
2. Community-led – particularly women-led – environmentally sustainable livelihoods
3. Improved solid waste management and environmental protection practices
4. Increased environmental and climate awareness action by schoolchildren and communities

Description of intervention/activities

1. Seaweed farming, including development of technical, financial and marketing skills and kit distribution
2. Mangrove forest restoration through the establishment of nurseries, tree planting and GIS monitoring
3. Waste management practices and sensitization, and awareness creation at the community level
4. School-based environmental and climate awareness and education through school clubs and activities

Outcomes achieved

Along the Kwale coast, eight communities are actively engaged in mangrove restoration through the establishment of tree nurseries by 476 community members (232 female and 244 male). The process began with a training session on appropriate mangrove species, nursery bed establishment, transplanting and the seasonality of mangrove planting. Through a partnership with local public university (Pwani University), the project mapped out 38 degraded sites with a total 500 hectares using GIS.

The community has now taken the initiative to establish nurseries and transplant mangrove seedlings to the degraded sites. To date 472,500 seedlings have been established in nurseries and 51,216 have been transplanted. To ensure sustainability, the community has registered a Community Forest

Association and are developing a Participatory Forest Management Plan to guide the reforestation, conservation and harnessing of forest resources.

The communities hold several parcels of seaweed farms, which are now producing hundreds of tonnes of seaweed. The farms have been planted by 514 community members (342 female and 172 male). The minimum amount they have earned from the produce is US\$10,000 in one year. Seaweed farming has provided a viable and non-seasonal income source to supplement other sources of income. Through seaweed farming, women have been empowered and are actively participating in income generation, giving them a voice in decision making at the household level. Through seaweed farming, communities have reported improved housing, improved access to health services, realize education opportunities for their children, and access capital to start small-scale businesses. Linkages with buyers has ensured that communities have a regular market for their produce.

Additionally, to date, three BMUs are collecting solid waste and selling it to recycling companies for income.

Employment impacts

Seaweed farming

The project has created jobs for participating community members, who earn from sales of seaweed. A total of 514 community members (342 women and 172 men) are participating at different stages, earning varying amounts depending on the crop cycle. Employment is mainly part time, with two people employed by Kibuyuni Seaweed Corporation on a permanent basis.

Income effects: Through seaweed farming, the participating community members are able to meet their daily dietary needs, access to health service and education opportunities for their children as well as purchase assets.

Mangrove forest restoration: The project has created 476 jobs (232 female and 244 male) for community members who are involved in the establishment of a commercial seedling nursery. Through formal group structures, the groups set up the nursery and sell seedlings to partners who are implementing mangrove restoration activities.

As of October 2022, 762,180 mangrove seedlings are in nurseries, and another 203,620 have been planted and 38,500 sold for a total of KES770,000. Once the seedlings have been sold, the group discusses how the income should be used.

Biodiversity and ecosystem benefits

The project has contributed to improving the restoration of local mangrove forests and enhancing the fish population through the conservation of existing mangroves, while also rehabilitating degraded sites.

Description of co-benefits

- More women have been recruited in job markets through their participation in seaweed farming and mangrove restoration.
- Improved, sound environmental stewardship is being practiced by participating community members, who have a better understanding of the nexus between mangrove conservation and fish farming, among other ecological benefits.
- Environmental education has improved through 4-K club (4-K stands for Kuungana, Kufanya, Kusaidia Kenya, loosely translated as “coming together, to act, in order to help Kenya”) participation in ecosystem conservation through water harvesting, tree planting and climate-resilient horticulture practices.
- Community cohesion has improved, along with a reduction in gender-based violence, as the project advocates for gender equity and inclusion, providing participating women the ability to earn income and participate actively in household-level decision making.

Key success factors and lessons learned

- Seaweed farming has provided women with an alternative supplemental income stream at the household and community level, promoting empowerment and agency.
- Community engagement and leadership in mangrove forest restoration and waste management is contributing to successful environmental management in the project locations.
- School-based environmental activities are promoting environmental best practices at home.

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Authors

Chiara Ambrosino, Phaniel Owiti

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Smart coasts in Mesoamerica

At a glance

Activity description and type of NbS	Actions to restore: Restoration of coral reefs, watersheds and coastal dunes Actions to protect: Protection of mangroves and coral reefs
Societal challenge(s)	Climate change Disaster-risk reduction Associated threats to nature and the economy Biodiversity loss and ecosystem degradation
Organization(s)	WWF Mexico, WWF Mesoamerica, WWF Germany, WWF US
Partners (identifying main implementers and partners, if any)	■ Mexico: National Commission of Protected Areas; Yucatan State Secretariat of Sustainable Development; Pronatura Península de Yucatán; and Centro Mexicano de Derecho Ambiental ■ Belize: Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development; Division/Department: Coastal Zone Management Authority and Institute; Hol Chan Marine Reserve; Sarteneja Alliance for Conservation and Development; Southern Environmental Association; and Toledo Institute for Development and Environment ■ Honduras: Ministry of Energy, Natural Resources, Environment and Mines; Division/Department: Department of Protected Areas / National Institute of Forest Conservation and Development, Protected Areas and Wildlife; Centro de Estudios Marinos; and Asociación Cuerpos de Conservación de Omoa ■ Guatemala: Ministry of the Environment and Natural Resources and Fundación para el Ecodesarrollo y la Conservación
Financing (source, amount)	US\$5.1 million total funding (4.7 million from IKI/German Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection; 0.4 million by WWF)
Timeframe	June 2018 to May 2023
Geographical focus	Mesoamerican Reef Ecoregion (Mexico, Belize, Guatemala and Honduras)
Biodiversity and ecosystem benefits	Protected and restored ecosystems serve as nurseries for marine species and as a microrefugia Habitat for species such as sea turtles, birds, and targeted fish species (parrot fish, snapper)

Employment effects	Job creation Livelihoods diversification Recreational activities (tourism)
Target beneficiaries (# people reached) – employment beneficiaries	79 people employed
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	3 000 people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	■ Mexico's Climate Change Adaptation Strategy for Protected Areas ■ Belize's updated Integrated Coastal Zone Management Plan ■ Several protected area management plans in the four countries ■ The updated NDCs of three countries have targets based on the science-based analyses that the project has produced.

Geographical focus

The project is focused on the Mesoamerican Reef Ecoregion, which is home to watersheds, mangroves, seagrass, coastal dunes and coral reefs. The project engages local and Indigenous communities in the coastal zones of the ecoregion that depend on natural resources for their livelihoods and are thus vulnerable to climate change.

Description of context and rationale for interventions

The Mesoamerican Reef System is the largest transboundary reef system in the world and contains the world's second longest barrier reef. The system stretches across four countries: Mexico, Belize, Guatemala and Honduras, along more than 1,000 km of coastline and is a hotspot for biodiversity including endangered marine turtles, more than 60 types of corals and more than 500 fish species.

Coastal and marine resources in this region provide essential ecosystem services, sustain key economic sectors, support the livelihoods of more than two million people and contribute to the protection of coastal communities against adverse effects of climate change. These areas are also among the most vulnerable regions worldwide to climate change impacts. The

management of these resources does not yet adequately take into account adaptation principles and measures. There is a need to strengthen capacities in coastal communities and government institutions to integrate climate change scenarios and adaptation measures to inform management and development policies for protected areas and coastal zones.

Societal challenge

Climate change adaptation and disaster-risk reduction: The project areas are prone to climate hazards. Implementing ecosystem-based adaptation measures is expected to reduce the vulnerability of people to climate change in general and in particular to coastal hazards such as erosion, sea level rise, and flooding from storm surges.

Objective

The initiative seeks to incorporate climate change principles into the management of protected areas and coastal development policies, with the aim of improving the capacities of coastal communities to adapt to climate change. The adaptation strategies are integrated into higher-level policy instruments such as coastal development plans and management plans for protected areas and into locally based adaptation measures.

Description of intervention/activities

- **Belize:** Mangrove protection (300–500 hectares) and restoration (TBD), and coral restoration (0.5–1 ha)
- **Honduras:** Watershed restoration: restoration of agricultural land, implementation of improved agricultural practices to conserve soil, establishment of riparian forest within 30 m of rivers
- **Guatemala:** Mangrove protection: at least 230 ha
- **Mexico:** Coastal dune restoration: 2,550 m

Outcomes achieved

The project's expected outcome is to strengthen the adaptation capacity of coastal communities and protected areas of the countries that make up the Mesoamerican Reef region.

Smart Coasts built a technical base around the importance of the conservation and restoration of coastal habitats for the well-being of communities in the

MAR region, especially in the face of climate change. Since the start of the project, the project has informed over 15 policy documents across the project countries, including updates to Nationally Determined Contributions, coastal management plans, and climate change policy instruments.

Moreover, government authorities and other relevant stakeholders have been trained to use the spatial analysis tools developed so as to allow for replication of the project approach in other regions.

Finally, the project is informing and supporting implementation of ecosystem-based adaptation options on the ground, which has included community participation as a key pillar.

Employment effects

A total 79 NbS jobs have been created, supported or enhanced, of which 55 per cent are held by women and 12 per cent by youth. The project created a variety of emerging jobs with NbS specializations: programme coordination, ecosystem restoration, environmental education, data and information gathering, legal or policy advisory, geospatial analysis, and participatory and inclusive processes. (See table for full list of job types. The top positions both at regional and country level coordination are led by women.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Regional project coordinator	Coordinates project activities at regional level, and oversees project execution, decision making, and adaptive management.	1	-	1	-	Permanent	Upper education
Country Project coordinator	Country coordinators lead and supervise the project's implementation locally, engaging various stakeholders, translating scientific information, and providing technical assistance.	4	1	3	-	Temporary Fixed-Term Part-time Contracted	Upper education
Communication coordinator	Leads development and deployment of communication materials for various audiences.	1	-	1	-	Permanent	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Monitoring and Evaluation specialist	Keeps track of progress against expected outcomes and outputs.	1	-	1	-	Permanent	
Project manager	Maintains relationships with donor, oversees overall project reporting to donor, and keeps the technical team informed about legal and administrative developments.	1	-	1	-	Permanent	Upper education
Scientific advisor	Engages with science partners and supports translation of technical information into actionable information.	1	1	-	-	Permanent	Upper education
Consultants	Support the project's work in specific areas of expertise, support project managers and complement their capacities. Consultants conduct both desktop and field work, depending on specific needs. Consultancy types include: communication, ecosystem restoration, environmental education, data and information gathering, legal or policy advice, geospatial analysis, and others.	44	24	19	10	Temporary Fixed-Term Part-time Contracted	Upper education
Park rangers	Park rangers work directly in the field, helping to manage protected areas and their resources. They conduct work such as monitoring and surveillance, but also engage with local community members.	1	1	-	-	Short-term employment	
Researchers	Researchers generally work in academic institutions and universities and have very specific and advanced expertise. They operate as project partners, generating technical/scientific information to support project implementation such as climate projections and ecosystem service models. Researchers can also support capacity building of other project members through training.	6	-	6	-	Temporary Fixed-Term Part-time Contracted	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Daily workers	Daily workers are often community members who are hired to conduct field work in their own communities such as ecosystem restoration and nursery management. They are paid on a daily basis after completion of work. These community members also often engage in other activities, such as environmental education.	19	-	-	-	Short-term employment	

Biodiversity and ecosystem benefits

The project supports the protection of mangroves, coral reefs, seagrass beds and coastal dunes, as well as the protection and conservation of critical habitat for turtle, bird and fish species, and areas that serve as nurseries for marine species.

Description of co-benefits

- The project supports capacity building of local stakeholders, including community members, local authorities and local organizations.
- Coral reef and mangrove conservation and restoration are expected to increase tourism, bringing economic benefits to local communities.
- Coastal dune, mangrove, seagrass and coral reef conservation and restoration protect community livelihoods and infrastructure from coastal hazards.
- Coral reef and mangrove health is expected to increase fish populations, potentially increasing fisheries-related jobs.

Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)

The project's science-based analysis has contributed to various subnational and national policies, including Mexico's Climate Change Adaptation Strategy for Protected Areas, Belize's updated Integrated Coastal Zone Management Plan, and several protected area management plans in the four countries, as well as the Nationally Determined Contributions (NDCs) of Belize, Guatemala and Honduras.

As of June 2022, the project has worked with government representatives of 17 different agencies to integrate future climate analyses into a total of 27 policy instruments and plans in the four countries.

Key success factors and lessons learned

The hands-on approach and continued engagement of country coordinators was critical for positive engagement of local and national government authorities and other stakeholders. However, the COVID-19 pandemic severely affected the team's ability to connect and engage with stakeholders. For some stakeholders, digital communications proved a useful way to overcome this challenge, but limited internet connectivity in rural areas made connecting with local communities more difficult.

To re-engage local community participants, the project reoriented its communication strategy to develop a 10-episode educational radio series, which was later transformed into a podcast and animated videos that were shared widely via local radio stations and social media. Their production took into account local languages and language variations, which were well received, reaching over 60,000 individuals.

Authors

Alejandra Calzada Vázquez Vela (WWF), Diego Portugal Del Pino

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Ten Billion Tree Tsunami Programme in Pakistan

At a glance

Activity description and type of NbS	Restoration of forests and rangelands Conservation of wildlife and protected areas Sustainable management of watersheds and rangelands
Societal challenge(s)	climate change mitigation and adaptation large-scale environmental degradation extreme weather events including rising temperatures, flooding and droughts
Partners (identifying main implementers and partners, if any)	Ministry of Climate Change (MoCC) Governments of four provinces (Punjab, Sindh, Balochistan and Khyber Pakhtunkhwa) and two independent territories (Gilgit-Baltistan, and Azad Jammu and Kashmir) A consortium including IUCN, FAO and WWF-Pakistan, carries out independent third third-party monitoring and evaluation (TPM&E) to ensure transparency at the request of MoCC.
Financing (source, amount)	Local cost: Government of Pakistan Forestry Component: 109.38 billion Pakistani rupees (US\$491 million) Wildlife Component: 15.59 billion Pakistani rupees (US\$70 million) Liabilities of Green Pakistan Programme: 210 000.000 Pakistani rupees (US\$950 000) Total cost: 125 184 billion Pakistani rupees (US\$562 million; 50% Federal Public Sector Development Program and 50% Provincial Annual Development Plans)
Timeframe	Phase 1: 2019–2023
Geographical focus	Pakistan
Biodiversity and ecosystem benefits	Enhanced forest cover Reduction of plastic waste in protected areas. Better conservation of Critically Endangered habitats Stricter regulation on illegal wildlife trafficking
Employment effects	The programme employed 1 420.962 men and women across Pakistan. Through the co-benefits, the programme would contribute to job creation in the long term.

Target beneficiaries (# people reached) – employment beneficiaries	1 420.962 jobs were created through the programme.
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	Pakistan's population of more than 230 million people.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	SDG 15 The updated NDC 2021 acknowledged the TBTP as a robust natural capital restoration effort for climate action.

Description of intervention

Pakistan is the fifth most populated country in the world and the seventh most vulnerable country to climate change. The country is facing a fiscal crisis and high rates of unemployment, and is currently being supported by an International Monetary Fund (IMF)-sponsored macroeconomic stabilization programme.

Pakistan also suffers from widespread environmental deterioration, with a forest cover of around 4.8 per cent. Large-scale deforestation resulting from land conversion to agriculture is the result of encroachment into forest areas by a fast-growing population. This has led to the loss of ecosystem goods and services and resulted in associated socio-economic impacts.

To address this, Pakistan's Ten Billion Tree Tsunami Programme (TBTP), inaugurated on 2 September 2018, aims to support the country's transition towards climate resilience by mainstreaming climate change adaptation and mitigation through ecologically targeted initiatives. With an initial budget of nearly 125.2 billion Pakistan rupees (US\$562 million), the programme set the ambitious goal of planting 3.3 billion trees between 2019 and 2023.

The TBTP is a nationwide programme implemented by the Ministry of Climate Change (MoCC) in partnership with its four provinces and two independent territories. A consortium including IUCN, FAO and WWF-Pakistan, carries out independent third party monitoring and evaluation (TPM&E) at the request of MoCC. The programme has several integrated and self-reinforcing components, one of which is to raise awareness of the programme and its intended outcomes among all stakeholders.

Workers support the collection and plantation of nursery seed stock to generate the saplings that are planted at designated sites. Natural forests are also being rehabilitated through assisted natural regeneration and the enrichment of soil through sowing. The programme used various afforestation approaches, including block plantation, linear plantation, mangrove plantation, riverine plantation, farm forestry, plantation of waterlogged and saline areas, and urban plantations.

Watershed management trainings and implementation helped to conserve soil and water in natural forests, strengthening their resilience. Plants were also given away for free or at subsidized rates for planting by landowners.

The programme developed participatory range management plans to support the restoration of rangelands and planted native fodder trees to improve their productivity.

Programme implementers have developed new national parks, biosphere reserves and management plans to strengthen their effective management. They are also working to promote ecotourism within new and existing parks and to strengthen waste management systems to reduce negative environmental impacts. The programme is promoting wildlife conservation and habitat improvement for biodiversity both within and outside protected areas.

TBTP is strengthening institutional capacity during activities with provincial forestry and wildlife departments, working with communities to support equitable natural resource management. The programme is also collaborating with multiple stakeholder groups, including universities and research institutions, to strengthen restoration and promote natural resource-based livelihoods. An endowment fund for forest and wildlife conservation has been established.

Objectives

The specific objectives of the programme are to enhance forest cover, conserve biodiversity, and strengthen national and local institutions.

Outcomes achieved

Enhanced forest cover: From April 2022 to July 2022, 261.36 million plants were planted, regenerated or distributed in the country by provincial and territorial forest departments (National Assembly of Pakistan 2022).

Institutional strengthening of ZSP: The Zoological Survey of Pakistan (ZSP) is the pioneer research organization for multidisciplinary zoological and wildlife-

related matters in the country. TBTP has supported the ZSP in its compilation of secondary data for mammals of Pakistan as well as in the development of taxon data sheets for the collection of sighting data for mammals of Pakistan. This will support the development of National Red Data Book for Pakistan's mammals. The country is also developing a biodiversity information portal for data collection (National Assembly of Pakistan 2022).

Employment effects

To date, the programme has created approximately 1,420,962 jobs for both men and women across Pakistan (see table). Through its support for climate change mitigation and adaptation, the programme will also indirectly benefit the country's population of more than 230 million people.

TYPES OF JOBS	GUARDIANS (NEGHABAN)	GUARDS (CHOWKIDAR)	DAILY WAGE WORKERS	SKILLED LABOURERS	TOTAL
Male	456 925	282 656	466 064	128 915	1 334.560
Female	73 898	1 944	5 463	5 098	86 402
Total	530 823	284 600	471 527	134 013	1 420.962

The programme created four types of jobs: guardians, guards, daily wage workers, and skilled labourers.

- Guardians (*neghaban*) act as custodians of a share in the forest under their protection. Local forest departments are responsible for hiring the guardians, who mainly earn monthly salaries fixed by the government.
- Guards (*chowkidar*) are employed to report on any damage or incidents in the forest authorities. The guards may not have a direct stake in the forest but are usually employed for longer periods.

Daily wage workers are paid according to standard government rates. Candidates who meet the eligibility criteria for digging pits and planting trees are recruited as temporary workers through communities or the local forest department. There is no guarantee that daily wage workers will be

re-employed. However, depending on the requirements of the task, preference is given to those who have already held the position.

Skilled labourers supervise the daily workers and are thus required to have specific skills in restoration or forestry.

Biodiversity and ecosystem benefits

TBTP has led to improved legislation and strengthened institutions throughout Pakistan, particularly focusing on enhanced management of protected areas such as biosphere reserves and national parks and on promoting eco-tourism based on international standards. The programme has also worked to reduce plastic waste in protected areas.

The programme has contributed to the revival of some critically endangered habitats. It has worked to curb illegal wildlife trafficking through the establishment of control desks in international and national airports, while also strengthening the partnership between the wildlife departments and national universities.

Description of co-benefits

A sub-initiative within the programme, the Billion Tree Honey Initiative, is expected to produce 70,000 metric tons of honey each year, which could generate an income of 25 billion Pakistani rupees (about US\$112 million) and provide 87,000 jobs. Similarly, protected area initiatives will provide job opportunities for 5,500 people.

Key success factors and lessons learned

One major success factor for the TBTP has been the continuity of the programme irrespective of changes in political leadership. Others include the crucial role of TPM&E, the use of native trees in afforestation, enhanced women's participation and the creation of green jobs. Key lessons include ensuring better selection of species for assisted natural regeneration and promoting the use of native species in ecosystem restoration programmes.

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Authors:

Asim Jamal (Third Party M&E Consortium for Ten Billion Tree Tsunami Programme, TBTP), IUCN Pakistan) and Mehmooda (IUCN Pakistan)

Scaling up Ecosystem-based Adaptation through faenas in Peru

At a glance

Location	Central Andes, Peru
Activity description and type of NbS	Wetland ecosystems and ancestral water technologies restoration Sustainable management and restoration of grassland ecosystems
Societal challenge(s)	Climate change adaptation and disaster-risk reduction Nature and economic benefits Food and water security Biodiversity loss and ecosystem degradation
Main partner	Instituto de Montaña (IdM)
Partners	International Union for Conservation of Nature (IUCN), the National Service of Natural Protected Areas (SERNANP), the Ministry of the Environment of Peru (MINAM), the communities of Miraflores, Canchayllo, Tomas and Tanta, and regional and local authorities.
Financing	International Climate Initiative (IKI) of the German Government (€562,070).
Time frame	July 2017 to June 2022
Biodiversity and ecosystem benefits	Protection of tropical high Andean hotspots in native ecosystems like wetlands and grasslands, including habitat for endangered species such as vicuña (Vicugna vicugna, a wild south American camel related with the llama)
Employment effects	Local jobs created Traditional volunteering opportunities Increased productivity of cattle and sheep
Target beneficiaries (# people reached) – employment beneficiaries	14 permanent and temporary jobs; 89 volunteering opportunities

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	Direct beneficiaries include 1,646 local inhabitants of Miraflores, Tanta, Tomas and Canchayllo Communities. Indirect beneficiaries include 15,000 people living within the Reserve and 232,706 inhabitants of the Cañete province downstream who use the water of the Cañete river basin. The El Platanal hydropower (220 MW) plant also uses water from the river.
Contributions to SDGs	DGs 1 (No poverty) and 15 (Life on land)

Geographical location

The Nor Yauyos Cochas Landscape Reserve (NYCLR) was created in 2001 and is located in the central Andes of Peru, in the regions of Lima and Junín. It spans an area of 221,268 hectares and its elevation ranges from 2,500 to 5,860 metres above sea level. The mountainous landscape of NYCLR encompasses a complex hydrological system of glaciers, waterfalls and 485 lagoons. It is also home to great floristic diversity, with 330 plant species catalogued to date (MINAM 2011). High Andean grasslands (including pajonal, puna grass, and bofedales) above 3800 m are the predominant vegetation, covering about 70 per cent of the Reserve's surface. The project works in four communities within the Reserve: Miraflores, Tanta and Tomas (located in Lima region), and Canchayllo (located in Junin region).

Context and rationale

The main reason for the creation of the NYCLR was to conserve the upper Cañete River basin and the Pachacayo River basin, important for water regulation, hydroelectric energy production, and other ecosystem services (INRENA 2006). Because of its status as a landscape reserve, the NYCLR allows the direct use of resources as established in the management plan (INRENA 2006).

The NYCLR is home to about 15,000 people (INRENA 2006). Anthropogenic activities have shaped the Reserve's landscapes for thousands of years, as evidenced by the distribution and characteristics of its flora and fauna and its wealth of intangible and material cultural values (INC 2009, INRENA 2006). Ancestral technologies such as terraces, agricultural and livestock practices, dams, canals and pre-Hispanic roads are still in use and reflect a profound knowledge of the environment and the development of very specific knowledge and skills.

Currently, the Reserve faces multiple pressures, such as changes in demographics and production patterns, overgrazing, and changes in rainfall patterns and extreme weather events such as frosts, droughts, floods, mudslides and landslides. Access to water and healthy pastures is essential for the well-being of local communities, who depend primarily on agropastoral activities for their livelihoods. In recent decades, there has been a general decline in agricultural production (especially of indigenous crops such as potatoes) associated with climatic uncertainty, lower agricultural prices, lack of labour due to migration, and increased livestock activities. The increase in cattle grazing, coupled with the weakening of communal organization, generates unsustainable management practices that are causing the degradation of the puna grassland ecosystems; the problem of overgrazing is widespread and urgently requires a change in the resource use system.³

There is a high level of uncertainty regarding future climate trends and scenarios in the Reserve.⁴ Temperatures have already increased by 0.21–0.32 °C per decade between 1950 and 2010, and a further increase of 0.61–1.12 °C is likely between 2011 and 2030. In addition, although total precipitation volume will remain fairly stable, distribution patterns will change significantly. Similarly, surface runoff is expected to decrease as the volume of water stored in glaciers and snowpack decreases. Future scenarios for the Reserve suggest changes that could affect pastures and water – vital resources for rural communities dependent on agricultural activities (FDA, 2013). The local population already perceives the impact of changing temperature, rainy season, and extreme events, confirming scientific findings (UNDP, UNEP, IUCN and IdM 2016).

Societal challenges and solutions

- Low income and lack of livelihood opportunities
 - * Strengthening and diversifying local livelihoods through the restoration of ecosystem services (i.e., fodder provision, water availability).
- Outbound migration
 - * Adapting ancestral technologies to current social context (i.e., using green-grey infrastructure that is less labour-intensive)

³ According to the inventory and evaluation of the reserve's natural heritage conducted by MINAM (2011)

⁴ According to the "Estudio de Vulnerabilidad e Impacto del Cambio Climático en la Reserva Paisajística Nor Yauyos-Cochas" (FDA 2013)

- Climate change and vulnerability to disasters:
 - * Addressing climate-related risks such as droughts, frosts, floods, mudslides and landslides.
- Food and water security
 - * Enhancing water storage and availability through sustainable and climate-smart ecosystem management.
- Biodiversity loss and ecosystem degradation
 - * Strengthening local social organization and knowledge to improve natural resources management (i.e., enhance livestock management and decrease overgrazing) in a context of climate variability and change.

Objective

The goal is to help local communities adapt to present and future climate change impacts. Currently, up to 70% of the local population depends on sheep and cattle grazing for their livelihoods. This makes them strongly dependent on healthy grassland ecosystems and a steady supply of water.

Description of intervention / activities

- **Actions to restore ecosystems and ecosystem services:** wetland and grassland ecosystems restoration, water storage and regulation.
- **Actions to sustainable manage:** water and grassland ecosystem management.

The project is implementing Ecosystem based Adaptation (EbA) measures focused on improving water storage and regulation and grasslands and livestock management in the three core areas: (a) strengthening local capacities and knowledge by promoting intercultural dialogue between scientists, practitioners and local community members (Zapata and Gleeson 2020); (b) institutional and community organization strengthening by co-developing the community grass and water management plan; and (c) improvement of natural infrastructure through the restoration of ancestral and modern water technologies for expansion and conservation of wetlands and for community management of native grasslands, as well as for improving the management and breeding of native vicuña (*Vicugna vicugna*, a wild south American camel related with the llama) (Zapata et al. 2020).

Outcome achieved

In three communities, organization strengthened and people have increased their capacities to adapt to climate change. In two communities, water availability has improved and water resources are now better distributed; grasslands are healthier and better managed, and livestock yields have increased due to these improvements. A household survey recently conducted in Miraflores (2022), showed that milk yields have doubled in average (from 4 to 8 liters per cow a day) compared to yields before the project; there is an increase of 41% in cheese production and an increase of 54% in cattle sale prices, improving family income⁵. Moreover, all surveyed community members have experienced significant improvements in their respective household economies. Regarding agricultural practices, nearly 90% of the community members surveyed adopted sustainable livestock practices with improved skills to better manage grazing after the project.

Employment effects

The project employs 14 people, covering diverse backgrounds from early career professionals to experts in the fields, as shown in the table. The project also integrates mainstream science with indigenous and local science, facilitating the development of NbS that take into account cultural and ancestral practices.

The majority of work is done through communal work or "faenas" – a traditional form of unpaid work for the improvement of communal infrastructure or for a service that provides a common good. This organizational practice can be found in most local communities around Peru. The faenas are usually contributions from community members, such as the reinforcement or raising of a dam that fills a lagoon in times of drought or other immediate infrastructure projects that are required within the community. In the Andes, there is a tradition of faenas or investment of labour for the common good that dates back to pre-Hispanic times. The number of tasks that all community members must contribute are agreed upon in the community's general assembly and are obligatory for all members. The contribution is generally in the form of unpaid labour. Those who do not comply are subject to a sanction, generally expressed through denial of the benefits that the community grants to its members (for example, distribution of benefits

⁵ According to the EbA measures effectiveness and impact assessments conducted by IdM (2022).

from the communal farm such as alpaca breeding, benefits granted by an agreement with a mining or hydroelectric company, or other benefits that come from the use of the territory).

In the context of this project, the community co-designed the EbA and supported the implementation through faenas. In 2019 (before the pandemic), the project carried out 14 faenas with an average of 20–40 people per faena. In 2022, the project resumed, having carried out 4 faenas, and 2 additional faenas are planned before end of September 2022.

The project has also contributed to the creation of full-time paid jobs for indigenous peoples and local communities (IPLCs), mainly facilitators, grasslands experts and interns.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Project officer	Team building, planning, implementation and follow-up of activities	1	-	1	-	Permanent	Higher education
Field assistant	Facilitation of participatory processes with communities	2	1	1	-	Permanent	Higher education
Knowledge management specialist	Support for various aspects of the project	1	-	1	-	Temporary Fixed-Term Part-time Contracted	Higher education
Consultants	Support for various aspects of the project	6	5	1	6	Permanent	Upper education
Interns	Support for various aspects of the project	4	1	3	4	Temporary Fixed-Term Part-time Contracted	Upper education
Volunteers	Support for various aspects of the project	3	-	3	3	Temporary Fixed-Term Part-time Contracted	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Communal work or faenas (Design and implementation phases)	Refer to description of faenas in main text.	60	48++	12++	10+	Temporary for the duration of the project but permanent for the needs of the community	Low-skilled
Communal work or FAENAS (Consolidation phase)	Refer to description of faenas in main text.	29	15++	14++	7+	Temporary for the duration of the project but permanent for the needs of the community	Low-skilled

*No details available on age

**No details available on gender

Additionally, the project also increased productivity of cattle and sheep, strengthening local livelihoods.

The project has also been part of the “Plataforma de Buena Gobernanza” of the Cañete river basin, a platform to promote mechanisms for payment for ecosystem services commonly known in Peru as Mechanisms of Retribution for Ecosystem Services (MERESE). Retributions in Cañete river basin were given as materials and resources to implement projects that restore ecosystems and maintain water in the upper part of the river basin.

Description of co-benefits

- Attracting other donors and projects related to EbA measures due to improved community organization.
- Reduction in cattle mortality due to increasing grazing area and water availability.
- Strengthening of communal identity through faenas.
- Strengthening of local livelihoods through increased cattle sale prices due to better livestock management and increasing milk yields, cheese production and alpaca wool production.

Key success factors and lessons learned

An inclusive approach was a key success factor through the co-design, implementing and monitoring of the EbA measures together with the local population. A high quality local participation should be sought at all times, which contributes to build local ownership and project continuity and sustainability in the long run.

Local people learned how to manage their territory and resources based on ancestral knowledge. It is core to make this knowledge available and promote the dialogue and exchange with scientific knowledge on EbA measurement design and implementation.

Ancestral technologies and infrastructure for water management and other resources have been available in the field for centuries and many of them are still adopted, although the current social context tends to discontinue their use. Green-grey infrastructures represent good alternatives to keep them working.

A joint work with the Natural Protected Area team should be done by sharing approaches and building local capacities. This contributes to both continuity and replication of EbA measures. This is crucial as they will continue working in the zone after the project ends.

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Authors

Mirella Gallardo (Instituto de Montaña), Yadira Mori (Instituto de Montaña),
Daniella Vargas- Machuca (Pontifical Catholic University of Peru), Florencia
Zapata (Instituto de Montaña), Diego Portugal Del Pino

Coastal dune restoration in Portugal

At a glance

Activity description and type of NbS	Coastal dune restoration, management and monitoring
Societal challenge(s)	Climate change and risk of increased natural disasters Biodiversity loss and ecosystem degradation Associated threats to nature and the economy
Partners (identifying main implementers and partners, if any)	Municipality of Almada Portuguese Environmental Agency
Financing (source, amount)	The ReDuna project was financed by the EU Structural and Cohesion Funds for coastal protection through the National Environmental Agency of Portugal.
Time frame	The project started in 2014. It was inaugurated in April 2015 and it is expected to continue as long as the hazards exist.
Geographical focus	Almada, a coastal city in Portugal with a 13 km coastline on the Atlantic Ocean. Residential area with primary services (agriculture) and tertiary services (many tourism-related) Almada is an important biodiversity corridor between two the Tagus and Sado estuaries.
Biodiversity and ecosystem benefits	Restoration of the coastal dune ecosystem and its functions Improved connectivity and functionality of green and blue infrastructure Reduced habitat loss and increase biodiversity richness Increased biodiversity Increased cultural richness
Employment effects	Increase recreational activities such as tourism
Target beneficiaries (# people reached) – employment beneficiaries	104 NbS jobs created

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The population of Almada was 177,268 in 2021. The city also receives more than 8 million tourists every year.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Dune restoration is recognized in the Regional Coastal Management Plan as coastal protection measures and actions. Alignment with SDGs 3,4, 6, 8, 11, 13, 14, 15 and 17

Description of context and rationale for interventions

The northern area of the coastal dunes in the City of Almada is experiencing increased erosion due to lack of sediment deposit and sea level rise. This makes this coastal area prone to erosion events and washovers (sediment deposited by waves washing over dunes during storm surges) and sea level rise, which have become more frequent since the late 1990s. Coastal protection a high priority in Almada, which receives millions of tourists every summer, as climate-related hazards pose a threat to tourism services and existing private infrastructure.

The ReDuna project started in 2014 in response to strong winter storms along the coast of Costa da Caparica that destroyed the dune system. The project replenished the beach sand and restored the dune profile along 1 km of coast using willow sand fences and 100,000 plants of native dune species. Pathways and fences were also built to reduce the human impacts, and communications aimed to raise awareness among visitors.

The restoration phase took 6 months, and monitoring and evolution of the project is ongoing to determine how the ecosystem responds to human and natural impacts. After each summer and storm season, maintenance crew work to restore the willow fences, replace vegetation and renovate walking paths to adapt these measures to new pressures.

Societal challenges

The project addresses:

- **Climate change adaptation and disaster-risk reduction:** Coastal dune restoration aims to foster resilience to storm effects and coastal erosion by ensuring a more stable sediment transfer and balance between the dunes, the beach and the ocean floor.

- **Biodiversity loss and ecosystem degradation:** This coastal dunes ecosystem includes several conservation priority habitats and species protected under the Habitats Directive of the European Commission (EC n.d.).
- **Associated threats to nature and the economy:** The area's current coastline regression threatens tourism and existing private infrastructure.

Objective

The project aims to restore the natural capacity of the Almada sand dune-beach ecosystem to respond to natural threats, while enhancing its resilience to sea-level rise and storms.

Description of intervention / activities

- **Actions to restore and protect:** Construction of willow sand fences and planting of 100,000 plants of native dune species.
- **Actions to sustainable manage:** Native species plantation and invasive alien species removal with the involvement of the local community.

Outcome achieved

Four years after the initial plantation, roots were more than 4 metres deep and in high density, forming a strong root network that stabilized the foredune (dune running parallel to the shore). In March 2018, the restored dunes provided an effective response to Storm Emma.

Geomorphological and ecological parameters were monitored at six-monthly intervals initially, and then yearly with indicators as geomorphological evolution, beach-dune sediment stock, biodiversity colonization (new plants and animals), vegetation survival, community structure evolution, impact of fences on survival, growing and establishment of plants, for example. To detect the site's geomorphological changes, a GPS-based monitoring of the transect was performed, creating a 3D-model of the dunes. Nowadays, photographic data can be easily obtained by drones, which is a non-intrusive method. The results obtained during the first two years of the project showed that 90% of the planted native species have survived, attracting 49 new wildlife species, which increased biodiversity and provided ecological resilience to the restored ecosystem.

Employment effects

The project has created 104 NbS jobs, of which 64 are related to the restoration, construction and maintenance of the ecosystem. Twelve jobs are considered permanent. Each year, the project hires 27 consultants from disciplines such as biology and geology, including both university students and young professionals. For implementation, the project employed 22 workers for the initial 2–3 months to assist with planting and installing sediment traps and pathways. There are an average of 10 drivers, and more than 30 cooking and cleaning staff.

The project has received the support of 1,040 volunteers (280 adults and 760 youth) since it began (around 200 per year before the COVID-19 pandemic, decreasing to around 40 during the pandemic).

Biodiversity and ecosystem benefits

- Restoration of ecosystems and their functions
- Improved connectivity and functionality of green and blue infrastructures
- Reduced habitat loss and increase in biodiversity richness
- Increased species diversity and genetic richness
- Improved ecosystem resilience
- Increased water infiltration and storage

Description of co-benefits

- Increased sense of ownership in the communities
- Increased well-being
- Increased willingness to invest in NbS
- Sustainable development of coastal regions

Policy alignment

The project is well aligned with regional/local strategies and policies. The typology of dune restoration is recognized in the Regional Coastal Management Plan as coastal protection measures and actions. The project aligns with SDGs 3, 4, 6, 8, 11, 13, 14, 15 and 17.

Key success factors and lessons learned

The project has observed many challenges, such as the economic valuation of ecosystem services, as there is an inherent uncertainty in attempting to quantify the economic value of non-marketed services. Moreover, the costs of the depletion of these services are rarely tracked in local economic accounts. Thus, the recognition of NbS as an effective solution for coastal defence is still not widely recognized. During the Portuguese coastal management plan revision, the main difficulty faced by the project was eligibility to apply for Structural and Cohesion Funds. Technicians and local government staff had to make the case for how NbS interventions and green infrastructure measures could effectively contribute to coastal management and foster disaster prevention.

The experience of Almada is an extremely useful case for all the Portuguese coastal dunes facing similar problems of erosion and coastal flooding. The ReDuna project is also a successful example of nature-based coastal dune management that can be applied more globally.

ReDuna has promoted strong involvement from community since the beginning, ensuring that stakeholders could understand and engage in the project's activities and that their experience was incorporated in the design of restored areas. The installation of facilities on the dune system, such as raised walkways and signage, encouraged local populations and tourists alike to interact with the ecosystem and become informed about its value and importance.

Owners of beach support structures were also able to gain economic revenue from the facilities throughout time, benefiting directly from the project through avoided damage and indirectly from increased tourism.

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Authors

Patricia Pinto da Silva (Municipality of Almada), Diego Portugal Del Pino

Boosting urban resilience in Freetown, Sierra Leone

At a glance

Activity description and type of NbS	Actions to restore: Reforestation of urban and peri-urban areas Actions to sustainably manage and protect: Monitoring and sustainable management of growth (such as in mangroves) Actions to protect: Roles for local community members include: team leaders, tree stewards, tree planters and growers, short-term daily tree planting and growing support workers, community climate action ambassadors, tree and plant nursery suppliers, among others.
Societal challenge(s)	Climate change Disaster-risk Biodiversity loss and ecosystem degradation
Partners (identifying main implementers and partners, if any)	The World Bank Freetown City Council (FCC) leads the project locally with the RUSLP PMU (Project Management Unit); Environmental Foundation for Africa (EFA) is the main implementer along with several community-based organizations and nurseries.
Financing (source, amount)	World Bank (grant financing), Global Environment Facility (GEF), and technical assistance and financing from the Global Facility for Disaster Reduction and Recovery (GFDRR)
Time frame	July 2021 – June 2025
Geographical focus	The RUSLP project has a country-wide focus, while the NbS urban forestry project Freetown the Tree Town Project focuses on Freetown, involving people within the city, in the surrounding watersheds, and other nearby communities.
Biodiversity and ecosystem benefits	Planting of local tree species that enhances the resilience and connectivity of ecosystems Halting deforestation and ecosystem degradation Protecting habitat
Employment effects	The project creates jobs and provides micropayments that support the diversification of livelihoods.

Target beneficiaries (# people reached) – employment beneficiaries	The project has so far generated 898 jobs (326 in the first phase and 550 in the second), with 22 permanent jobs (employed in both phases)
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The project aims to serve the entire population of the city of Freetown and those residing in the surrounding water catchments.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	NDC target of reducing conditional emissions by 25% before 2050 SDG 1, 2 (with fruit trees), 3, 5, 6, 11, 13, 14 and 15. Local Conservation Management Plans (CMPs) and Community Action Plans (CAPs) which identify priority threats to conservation in each site and explore options to address them.

Description of context and rationale for interventions

Sierra Leone's urban population has been rapidly growing in the past five decades, with over 40 percent of the population now living in urban areas (Statistics Sierra Leone 2016). Urbanization has continuously expanded into hilly and mountainous areas, increasing their overall vulnerability to natural catastrophes. Topography and high annual mean rainfall result in high exposure to a range of climate-related hazards, including recurrent flooding, landslides and droughts; coping with such hazards has been made harder by challenging socio-economic conditions. The country is ranked 24th in the world for overall natural-hazard risk, 8th in disaster vulnerability, and 6th in lack of adaptive capacities to natural shocks (Bündnis Entwicklung Hilft and IFHV 2018). In August 2017, Freetown heavy rainfall resulted in localized landslides and widespread flooding in the city, causing over 1,000 casualties and significant economic damage.

This project will contribute to the FCC's goal of increasing tree and vegetation cover by 50 percent from 2018 levels by 2022, as a core component of the Resilience Pillar in the "Transform Freetown" agenda for 2019–2022, as well as to the Medium-Term National Development Plan's tree planting and greening objectives.

Specifically, the project aims to:

- Restore degraded forests along the urban periphery, especially in upstream water catchment areas
- Green urban spaces
- Reforest, restore and prevent further degradation of estuarine mangrove forests
- Reduce landslide risks through planting trees, shrubs and grasses in strategic areas, including a former landslide zone
- Create nationwide awareness about the challenges society faces as a result of deforestation (through the Climate Youth Ambassadors programme)
- Build local capacities to plant and grow trees
- Build local forest and climate stewardship leadership skills, awareness and capacities
- Harness novel digital technology using low-cost local smartphones for tree tracking and growing

Societal challenges

- The project addresses:
- Climate change and disaster risk, specifically:
 - * Mitigating the risk of landslides through soil stabilization
 - * Surface and pluvial flood risks
 - * Water shortages through increased groundwater infiltration
- Biodiversity loss and ecosystem degradation by reducing deforestation through tree planting and extensive awareness-raising.

Objective

The overall aim of the project, as it relates to the “Freetown the Treetown” campaign, is to improve urban resilience, reduce disaster risks, increase liveability and provide green jobs.

Description of intervention/activities

- **Restoration:** Reforestation of urban and peri-urban areas
- **Protection:** Significant training and engagement of local community members as planting team leaders, tree stewards, tree planters and growers, short-term daily tree planting and growing support workers, community climate action ambassadors, tree and plant nursery suppliers and other jobs.
- **Sustainable management:** Installation of permanent pillars in the estuary areas to demarcate the boundaries for settlements from mangrove and river areas. All trees, shrubs and grasses planted and being grown are tracked and third-party verified using the TreeTracker app⁶ on locally available smartphones that create a unique geotagged ID for each new tree planted. To incentivize tree growing and not just tree planting, growers periodically receive micropayments via their smartphones for keeping trees alive.⁷

Outcomes achieved

Phase 1: 251,000 trees planted

Phase 2: 249,519 trees planted, including 66,000 mangrove trees from locally collected propagules, 44,635 shrubs and 20,000 grasses

Employment effects

The project generates two main types of employment: novel part-time tree growing jobs and other more conventional green jobs. The first employment method is atypical, as its income earning potential varies significantly based on the number of trees grown and the fact that mobile micropayments are made based on tree growth data verified through a third-party app. Growers are allocated a fixed number of trees, based on a few factors such as planting location, to ensure simplified maintenance, limited traveling distances, and enhanced local community stewardship, engagement, and ownership over tree survival. This employment option has attracted significant interest, especially among existing growers and community members interested in implementing similar activities beyond the existing project.

⁶ See <https://map.treetracker.org>

⁷ See the project blog: [Please add URL]

The project generated 22 jobs spanning both phases, as well as 326 temporary jobs during the first phase and 550 during the second. Both full-time and part-time fixed-term positions were created for the FCC, RUSLP PMU, EFA, and several CBOs and nurseries. Roles include establishing, conducting and/or supporting tree planting operations; growing tree seedlings; collecting, transporting and distributing trees from nurseries; assisting with or conducting tree planting; and watering and maintaining trees, among others. Emerging green jobs within the NbS sector for technical staff, for example, are also on the rise as new work is required to validate and monitor novel project approaches. The following table summarizes the different jobs generated.⁸

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Project Manager	Executive directors, project managers, coordinators, and officers	5	5	0	2	Permanent and fixed-term full time contract	Upper education
Administrative staff	Financial assistance	2	1	1	1	Fixed-Term Full Time Contract	Upper education
Technical staff	Data coordinators, monitoring and validation	9	5	4	9	Fixed-Term Full Time Contract	Min is national higher diploma, average is BSc.
Driver		1	1	0	1	Fixed-Term Full Time Contract	High school
Head of CBO		11	10	1	0	Permanent	-
CBOs administrative staff	Financial assistance	11	n.d.	3	3	Temporary Fixed-Term Part-time Contracted	Upper education
Growers	Responsible for growing and monitoring trees	372	n.d.	nd	372	Temporary Fixed-Term Part-time Contracted	-

⁸ Note that numbers may not tally as positions are summarized for phases 1 and 2 and, in some cases, the same person was employed in both phases.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Team leaders	Responsible for managing teams	35	n.d.	n.d.	35	Temporary Fixed-Term Part-time Contracted	-
Daily workers	Support tree planting, dig holes, transport trees from storage site to planting area, assist with tree planting	153	?	?	153	Short-term (3 months)	-
Tree nursery agrotechnicians	Responsible for technical aspects of tree growing. On average one agrotechnician per nursery (mostly men)	19	9	10	6	Mixed (permanent/temporal)	Bachelor's degree
Tree nursery staff	Responsible for growing trees, managing basic requirements in the nursery, etc. (mostly men)	290	?	?	190	Temporary	-

n.d.: No Data

Biodiversity and ecosystem benefits

Planting of native trees such as local mangrove trees propagules, fruit trees, and propagated seedlings from healthy local tree cuttings provides critical biodiversity benefits, especially for upstream locations. Further, the integrated planting of fast-growing non-invasive exotic species, ornamental trees, and suitable shrubs and grasses helped to rapidly enhance existing ecosystems. The programme aims to optimize local biodiversity, where feasible, through planting a variety of species within one planting location. It is hoped that this approach will enhance forests' resilience to pests, diseases and general environmental stresses; increased habitat provision for a wider variety of native insect, animal and other plant species; and a wider variety of environmental regulating services such as mitigating the risk of pluvial (extreme rainfall) flooding.

Description of co-benefits

Anticipated future co-benefits include: reduced heat stress, improved air quality, reduced noise pollution, increased property values for some areas, increased groundwater infiltration, and increased water retention and carbon sequestration.

Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)

The project supports carbon sequestration, thereby contributing to the country's NDC target of reducing conditional emissions by 25% before 2050 (UNDP 2022).

The project also directly supports SDGs 1, 2 (through fruit trees), 3, 5, 6, 11, 13, 14 (both through catchment and mangrove planting), and 15.

Key success factors and lessons learned

The factors linked to the greatest success have been engagement with individuals across the city and within each community, and building their capacities to become tree planters, growers and environmental stewards. The tree survival rate has been very high as a result of this engagement and the use of the Tree Tracker App, which allowed for systematic, cost-effective third party/virtual verification that trees were still alive and growing. Finally, a micropayment incentive model has contributed to keeping trees alive.

Tree species selection proved to be a challenge, due to lack of knowledge on native tree characteristics, growth rates, suitable growing conditions, and a lack of nurseries propagating native tree seedlings among other factors. This posed several challenges for the selection and integration of these species within the planting and growing strategy.

Finally, if a sufficient number of trees are planted and require growing, and if a longer-term financing mechanism is established, the part-time employment approach adopted for tree growers could potentially result in full-time employment. However, with a dispersed non-plantation type of planting regime, it can be more challenging and costly to provide full-time employment for growers as, maintaining and growing trees in spatially dispersed areas may require transport across long distances, leaving insufficient time to ensure all trees are properly managed.

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Authors

Larissa Jenelle Duma (World Bank), Diego Portugal Del Pino

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Landscapes for Livelihoods in Umzimvubu Catchment, South Africa

At a glance

Activity description and type of NbS	Actions to restore: Landscapes mountain restoration Actions to sustainably manage: Grassland management and protection, clearing invasive alien species
Societal challenge(s)	Climate change Water security Food security Disaster-risk reduction Nature and economic benefits Biodiversity loss and ecosystem degradation
Partners (identifying main implementers and partners, if any)	Umzimvubu Catchment Partnership (UCP), convened by Environmental and Rural Solutions (ERS) WWF South Africa (SA), Conservation International SA, LIMA Rural Development Foundation, SaveAct, Yes4Youth and Mahlathini Development.
Financing (source, amount)	ERS funding is approximately US\$1 725 150 / R25 million.
Time frame	2013 - present
Geographical focus	South Africa, Eastern Cape Province, Alfred Nzo District, Matatiele Local Municipality. All communal tenure areas, inhabited and used by indigenous people. Focus is in six traditional authority areas in the upper Umzimvubu catchment.
Biodiversity and ecosystem benefits	natural regeneration of grasslands and watershed services.
Employment effects	Creation of NbS jobs Livelihood diversification Youth skills development
Target beneficiaries (# people reached) – employment beneficiaries	The UCP organizations employed 35 permanent staff plus additionally each partner organization has made different numbers of temporal and short-term contracts.

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	2 269 sheep farmers shearing wool for sale 806 Grazing Association members, 83 percent farming cattle for market while the other 17 percent are either traditional healers harvesting medicinal plants or youth engaging in eco-tourism.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Biodiversity Act (Act 10 of 2004) National Water and Sanitation Master Plan

Description of context and rationale for interventions

Communal rural rangelands in the Eastern Cape of South Africa (SA) are recognized internationally as hotspots for conservation. Yet they are often overgrazed, eroded and infested by invasive alien plant species. Rangelands are defined as grasslands, savannah and shrublands which provide a source of food for livestock and play a critical role in sustaining rural communities. They also help provide resources such as water, firewood, wild foods and medicinal plants. Widespread habitat loss on rangelands, together with uncertain weather conditions have a direct impact on the people whose livelihoods are linked to rangelands, especially the rural poor.

The Umzimvubu Catchment Partnership (UCP) was established in May 2013 by a voluntary alliance of over 35 civil state and research partners, together with local authorities. It is based on a non-binding Memorandum of Understanding (MoU) which underpins a common vision of working together to restore the natural resources and ecological functions of the catchment to secure livelihoods and boost climate change resilience. The upper catchment spans two of the 22 national Strategic Water Source Areas, which together form less than 10 per cent of the country's land area and contribute almost 60 per cent of its freshwater supply. Although the focus has been in the upper watershed area of Matatiele, the UCP covers the entire length of the Umzimvubu basin down to Port St Johns, where it collaborates with coastal partners.

Another key focus is the protection of springs as year-round potable basic household supply. Most residents in the montane settlements have some form of dependence upon springs. These springs have been in use for decades but are now facing quality and quantity challenges from climate change as well as contamination from livestock access, waste and alien plants, resulting in disease and long queues for collection.

Societal challenges

The project supports:

- **Nature and economic benefits:** Local value chain opportunities, including red meat, wool, alien plant biomass, circular waste recycling, climate smart food production, etc .
- **Biodiversity and ecosystem restoration:** The restoration on grasslands leading to the proposed establishment of a 50 000 ha protected area, which will have managed grazing, reduced poaching and reduced wildfire incidents
- **Water security, and protection of grasslands as watershed services and spring protections** which will reduce the wide scale loss of groundcover and topsoil
- **Food and Health security** by considering and improving stewardship of wild foods and medicinal plants through awareness building on indigenous harvesting techniques to protect biodiversity and traditional healers livelihoods.
- **Climate change adaptation and disaster-risk reduction** by building nature climate resilient infrastructure such as grassland

Objective

UCP's mission statement is 'Together we do more for people and the environment in the Umzimvubu Catchment'. This implies collective action and strong partnerships to move towards its goal, which is for healthy resilient ecosystems to function in the Umzimvubu Catchment providing reliable services and benefiting local and downstream people.

Description of intervention/activities

- **Actions to restore:** Landscapes mountain restoration, rehabilitation of water tower
- **Actions to sustainable manage:** Grassland management and protection following principles of agroecology and clearing invasive alien species which include monitoring of grassland and water resources recovery (quality and quantity)

These activities are complemented by community awareness campaigns, livestock auctions as a tool to reduce pressure on the land while making

income for livestock owners, recognizable branding of local livestock, signing of conservation agreements and monitoring of their implementation.

Outcomes achieved

- Restored more than 5500 hectares of grazing, through reviving traditional governance practices and fire management through collaboration with Grazing Associations
- Generated almost R40 million (US\$2.3 million) through mobile cattle auctions for more than 600 farmers, 30 per cent of which are women
- Cleared over 2500 ha of alien plants, and thereby saved more than 5 billion litres of water which has increased the potential for water availability downstream and for ecological services
- Protected 30 springs for village water supply, through the training of local technicians and usage of local materials, supplying over 6000 households and more than 30 000 people with safe, daily water access
- Fostered more than 900 local youth in a variety of internship and work experience programmes
- Been recognized as the ‘first of its kind in Africa’ in terms of certification by the global standards FSC (Forest Stewardship Council) for its innovative biomass value chain, converting problematic alien trees into charcoal in a communally-owned landscape, with the first Payment for Ecosystem Services (PES) sale approved

Employment effects

The core local implementing NGOs have mobilized investments in excess of ZAR75 million (US\$4 million) into the Matatiele area in the last 3 years, employing more than 35 permanent staff. ERS, the local NGO leading the alliance, has employed 11 local staff (6 women, 5 men, 7 of whom are under 35 years old) on full-time contracts. In addition, it has created important part-time employment opportunities.

ERS has employed 95 youth interns on various short-term contracts since 2019, with funding from various supporters including WWF, the Presidential Employment Stimulus and First Rand Foundation (banking sector). ERS has also employed over 340 local village-based beneficiaries since 2017, in various short-term projects mainly related to alien plant clearing, as well as spring protection and as spring monitors. These beneficiaries are 60 per cent women

and 55 per cent youth. Lastly, ERS also provides part-time contracts to 11 local youth Ecochamps that are employed on annual contracts. These Ecochamps are all under 30 years old, and 40 per cent are women. They have no tertiary qualifications but are involved in providing short training and hands-on in service learning in themes related to NbS such as rangeland management while also data collection linked to research projects using smart phone apps, and general awareness sharing.

An interesting angle currently emerging is the involvement of traditional healers in rangeland restoration and planning. Their 'industry' or practice is completely dependent upon access to and protection of wild plants in the mountain rangelands. Lastly, The NbS activities are combined with other climate solutions such as the creation of five eco-charcoal production enterprises which are led by youth groups.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Restoration	Alien invasive clearing; water and spring rehabilitation; Livestock Farmer support	152	58	94	152	Fixed-Term Full Time Contract	Upper secondary
General worker	Wattle clearing in Ward 21 Mvenyane	429	270	159	429	Fixed-Term Full Time Contract	Post-secondary non-tertiary education
General workers and Supervisors	Wattle Clearing in Ward 21 Mvenyane and Supervise Team of wattle clearers	356	224	132		Fixed-Term Full Time Contract	Less than primary, primary and lower secondary
Supervisors	Supervise Team of YES youth doing restoration activities	7	4	3		Permanent contract	Upper secondary and post-secondary
Stewardship Officers	Rangeland management, livestock management, monitoring and evaluation	5	3	2		Fixed-Term Full Time Contract	Upper secondary and post-secondary

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Administrative Associate	Administration, YES and Jobs4Nature programme support	1		1		Fixed-Term Full Time Contract	Upper – level education - bachelor
ERS Youth interns		95	47	48		Temporary Fixed term contract	High school diploma
EcoChamps	The number of Ecochamps is variable and depends on available funding. Ecochamps whose main responsibilities rangeland management and monitoring, research and data capture are deployed close to the communities and report to ERS. Previously there were 40 between 2019 and 2020, 25 in 2020/21.	11	8	3	11	Temporary Fixed term contract	Lower level secondary High School Diploma
ERS director		2		2	0	Permanent contract	University degrees
ERS middle management		4	2	2	2	Permanent contract	University degree National Diploma
ERS supervisory/ coordinators		3	1	2	2	Permanent contract	University degree National diploma
ERS admin/HR		2	1	1	2	Permanent contract	National Diploma
Eco charcoal production	Conduct day to day labour activities in 5 Eco Char Producer Enterprises	26	16	10	26	Fixed-Term Full Time Contract	Upper secondary

Biodiversity and ecosystem benefits

Clearing invasive alien species allows natural regeneration of grasslands and watershed services. Water benefits have been calculated at approximately 2000 million litres of water replenished / saved through clearing of in excess of 2000 ha (all NGOS estimated total).

Description of co-benefits

- Enhancing inclusive gender-sensitive and youth empowered governance in communal landscapes.
- Involvement of youth in co-creating solutions beyond the NbS strategy to support local challenges such as the eco-charcoal enterprises from wattle trees.
- Adoption of traditional practices such as rotational resting, protection of indigenous medicinal plants for use by traditional healers, and indigenous knowledge systems.

Policy alignment

The policy is aligned with the National Environmental Management: Biodiversity Act (Act 10 of 2004) and the National Water and Sanitation Master Plan which recognize the importance of the restoration of strategic water source areas.

Key success factors and lessons learned

Youth internships in the environmental and water sector provide excellent opportunities for local youth, both school leavers as well as graduates, to obtain real work experience, in their home landscape, contributing to local development as well as retaining family integrity and reducing outflow of human capital from the area.

The youth engaged with eco-charcoal production needed assistance with aggregation of products to generate viable volumes for export. Small business development is a tough arena and it can be difficult to develop the right product and get sufficient volume to get access to markets. For example, the eco-charcoal teams had to go through a number of design iterations and had to meet the FSC strict global standards. Both cattle and eco-charcoal producers needed support for certification which rewarded sustainable production practices with preferential market access and prices.

Authors

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Large-scale Ecosystem-based Adaptation in The Gambia

At a glance

Activity description and type of NbS	Ecosystem-based adaptation
Societal challenge(s)	Climate-induced increased and intensified storms, coastal erosion, salt intrusion, erratic rainfall, droughts and floods leading to losses in agricultural and livestock productivity
Partners (identifying main implementers and partners, if any)	Implementing entity: UN Environment Programme Executing entity: Ministry of Environment, Climate Change and Natural Resources (MECCNAR) Partners: Ministry of Environment, Climate Change, and Natural Resources (MECCNAR); Ministry of Finance and Economic Affairs (MoFEA); Department of Forestry (DoF); Department of Parks and Wildlife Management (DoPWM); Department of Agriculture (DoA); Social Development Fund (SDF); Gambia Chamber of Commerce and Industry (GCCCI); Department of Community Development (DoCD); Department of Livestock Services (DLS) National Environment Agency (NEA)
Financing (source, amount)	Green Climate Fund grant: US\$20.5 million Co-finance: US\$4.97 million Total: US\$25.47 million
Timeframe	2017–2023
Geographical focus	Four regions of The Gambia: Lower River Region; Upper River Region; Central River Region North; and Central River Region South
Biodiversity and ecosystem benefits	10 million mangrove propagules planted, which will protect coastal villages from storm surges while providing habitat for many fish species Goal: to rehabilitate 12,788 ha of degraded forest, savanna, and mangroves, and an additional 3,000 ha of farmland
Employment effects	To date, 60 beekeeping businesses have been established, employing 398 people (121 women) mostly part time. Goal: Ultimately, more than 500 are expected to be generated from the target 176 natural resource-based businesses.

Target beneficiaries (# people reached) – employment beneficiaries	Goal: 8,376 households with an increased in cash income by at least USD330 per year Goal: 176 sustainable natural resource-based businesses established directly employing more than 500 people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	Goal: A total of US\$13.5 million is projected to be raised over 20 years for the National Forest Fund through taxes and licensing fees.

Description of context and rationale for interventions

The consequences of climate change in The Gambia are stark. Temperatures, storms, coastal erosion, salt intrusion, erratic rainfall, droughts, and floods have increased and intensified, resulting in reduced agricultural and livestock production and unsustainable extraction of resources from forest ecosystems by rural households. This is threatening the heavily rain-dependent agricultural sector, which employs 44% of the country's workforce and provides two-thirds of household income. Sea-level rise and salt intrusion into freshwater wetlands have all but eliminated rice production in the western half of the country, causing “hunger seasons” between July and September.

UNEP is supporting The Gambia's government with its largest adaptation project. Funded by the Green Climate Fund, the aim of this large-scale Ecosystem-based Adaptation (EbA) intervention is to build climate resilience over large areas, promote climate-resilient sustainable development, and develop a sustainable natural resource-based economy.

Objectives

The main objectives of this project are:

- Rehabilitating 12,788 ha of degraded forest, savanna, and mangroves, and an additional 3,000 ha of farmland.
- Increasing the cash income of 8,376 households by at least USD330 per year in a country where 60% of the population live below the overall poverty line, thanks to the adoption of diversified, climate-resilient livelihood options (including fisheries, agriculture, natural resource-based businesses), as well as the restored landscapes which are sources of raw materials that will be processed and traded by the NR-based enterprises

- Establishing 176 sustainable natural resource-based businesses with a cumulative gross cash return of US\$4,515,270 over 20 years. The businesses are likely to include: sustainable forest collections; beekeeping; ecotourism; furniture manufacturing; food processing; baobab bioprospecting; and tree nurseries.
- More than 500 people are expected to be directly employed by the enterprises and these businesses will provide almost US\$677,270 in annual contributions to the National Forest Fund (NFF), through taxes and licensing fees.
- A total of US\$13.5 million will be raised over 20 years for the National Forest Fund from taxes and licensing fees.
- Providing strategic recommendations and technical support to strengthen policies for the participatory management and benefit-sharing.

Description of intervention/activities

The project involves three main components:

5. restoring 15,788 hectares of degraded forests, mangroves, savannahs, wildlife areas, and farmlands with climate-resilient plant species that provide goods for consumption or sale
6. facilitating the establishment of 176 commercially viable natural resource-based businesses managed by local communities and involving activities such as beekeeping, furniture manufacturing and food processing
7. providing strategic recommendations and technical support to strengthen policies on participatory management and benefit sharing.

Outcomes achieved

Land rehabilitation: In the first two years, 10 million mangrove propagules were planted, which protect coastal villages from storm surges while providing habitat for many fish species.

Effects on work

To date, 60 beekeeping businesses have been established, employing 398 people (121 women), mostly part time. Ultimately, more than 500 are expected to be generated from the target 176 natural resource-based businesses. In addition, ecosystem restoration activities are creating work opportunities in tree nurseries, as well as in planting and maintenance. These jobs are paid at less than minimum wage on the grounds that the employees/ volunteers also benefit from this work.

Key success factors and lessons learned

This project illustrates the potential of NbS to generate significant numbers of jobs in rural communities. More detailed record-keeping of both part- and full-time jobs created by the project, as well as details on the quality of the work and the level of pay, will enable a better understanding of the potential of NbS to generate work. Both donor organizations and project implementers should be encouraged to provide this information.

Author

Oscar Ivanova

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Methodologies and units used to estimate work in Forest Landscape Restoration

Key points

- Several academic studies on jobs in restoration have been published
- The Restoration Barometer is a tool that reports jobs created through restoration
- Different methodologies are applied to estimate jobs
- Different units are used to report job creation impact of restoration
- There is a need for further data collection on restoration and the development of models to support estimates of indirect and induced impacts at the global level.

Introduction

Globally, there is a variety of different commitments to restore degraded landscapes. The Bonn Challenge, launched by the Government of Germany and the International Union for Conservation of Nature (IUCN) in 2011, is a global effort to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020, and 350 million hectares by 2030.⁹ The Bonn Challenge is aligned with several regional initiatives, specifically Initiative 20x20 in Latin America,¹⁰ the African Forest Landscape Restoration Initiative (AFR100),¹¹ and ECCA30 in Europe, the Caucasus and Central Asia.¹² The aim of these initiatives is to support countries in achieving their commitments to different multilateral agreements (UNFCCC, UNCCD and CBD) as well as to achieve the SDGs. The UN Decade of Restoration aims to strengthen global efforts to prevent, halt and restore the degradation of ecosystems.¹³

⁹ See <https://www.bonnchallenge.org/>

¹⁰ See <https://initiative20x20.org/>

¹¹ See <https://afr100.org/>

¹² See <https://infoflr.org/bonn-challenge/regional-initiatives/ecca30>

¹³ See <https://www.decadeonrestoration.org/>

Methodologies applied and units used to estimate the job impact of FLR

In order to align the growing efforts to restore degraded landscapes with other policy objectives, there is also an increasing effort by research institutes and organizations to provide impact estimates of the restoration actions implemented globally. Although the original focus was on estimating and reporting the number of hectares under restoration and the amount of carbon sequestration achieved, there has been an increase in the number of estimates of different social, financial and environmental impacts. This includes aiming to understand if FLR can create jobs and quantifying this potential.

Edwards and co-authors (2013) examined the economic impact of the expenditures from the American Recovery and Reinvestment Act (ARRA) of 2009, administered by the National Oceanic and Atmospheric Administration (NOAA) for coastal habitat restoration projects around the USA. They used an economic **input/output software** called IMPLAN (Impact Analyses and Planning) to estimate the overall jobs created and the economic impacts of these restoration projects. The software was used to generate estimates for the economic multiplier effects of expenditures and employment in “**full-time equivalent**” (FTE) job-years. The IMPLAN estimated jobs figures included direct, indirect and induced jobs.

BenDor et al. (2015) used a national **survey of businesses** that participate in restoration work to estimate the value of revenue and the **number of jobs** (full-time and part-time) directly associated with the restoration economy in the USA. In addition, they used the survey results as inputs into a national **input-output model** (using IMPLAN) in order to estimate the indirect and induced economic impacts of restoration activities, including jobs.

Finally, Brancalion et al., (2022) used the results of an online **survey**, led by the main restoration networks in Brazil, to understand and quantify the current and potential ecosystem restoration jobs in the country. They classified jobs as **temporary** (namely, seasonal jobs, in which people are only hired for part of the year) or **permanent**¹⁴ (namely, jobs in which people become part of the ongoing staff of a given organization).

¹⁴ In their study, Brancalion et al. (2022) defined temporary jobs as seasonal jobs, in which people are only hired for part of the year, and permanent jobs as jobs in which people become part of the ongoing staff of a given organization. The survey asked respondents to identify the number of temporary/seasonal workers and the number of fixed/permanent workers hired during a year.

In addition to its utility for research, the **Restoration Barometer** is a tool used by different countries around the world to track the progress of restoration targets across all terrestrial ecosystems, as well as coastal and inland waters. It records the size of the area being restored as well as the corresponding climate, biodiversity and socio-economic benefits.¹⁵ The Barometer has selected a single indicator for socio-economic impacts – namely, the number of jobs created – to monitor the socio-economic benefits that may flow from FLR. Given that data on employment is often broken down into distinct categories, the Barometer is flexible enough to designate jobs by their characteristics (e.g. job duration or job type, including maintenance versus implementation)¹⁶ and the demographic characteristics of workers (e.g. by sex).

For the current reporting period (2019–2022), different methodologies were applied in different countries and different units were then used to report on this indicator. In Mexico, to determine the number of jobs derived from restoration actions, Simonit et al. (2022) used the data on labour¹⁷ associated with restoration projects reported in public databases. When these data were not reported, the authors used national references for each reforestation action, as stipulated by the guidelines from the National Forestry Commission.¹⁸ Finally, for the restoration actions for which no average labour data were found in government databases and which were not considered in the official national references, literature was used to develop a standard conversion factor related to the areas restored. Results were reported as the number of labour days per year associated with the implementation of the different restoration actions. For Costa Rica, Nello et al. (2022a) used data from economic models, which expressed the labour days/ha needed for different types of restoration interventions. They expressed data in FTE/year, per type of restoration actions, and then used estimates from relevant literature to estimate how many of the jobs were created for women and for men. For the Barometer Report of Costa Rica, they made a distinction between short-term, and medium- and long-term employment. Short-term employment was related to the labour needed to implement restoration actions, typically

¹⁵ See <https://restorationbarometer.org/>

¹⁶ See <https://infoflr.org/bonn-challenge-barometer>

¹⁷ Average number of labourers/day, considering specialized and non-specialized labour (including when using equipment).

¹⁸ "Agreement by which the reference costs for reforestation or restoration and its maintenance for environmental compensation for land use change in forest land and the methodology for its estimation are issued" published in the Official Gazette of the Federation in 2006 and updated for 2014, as well as in the "Terms of reference of the support program for sustainable forest development 2018".

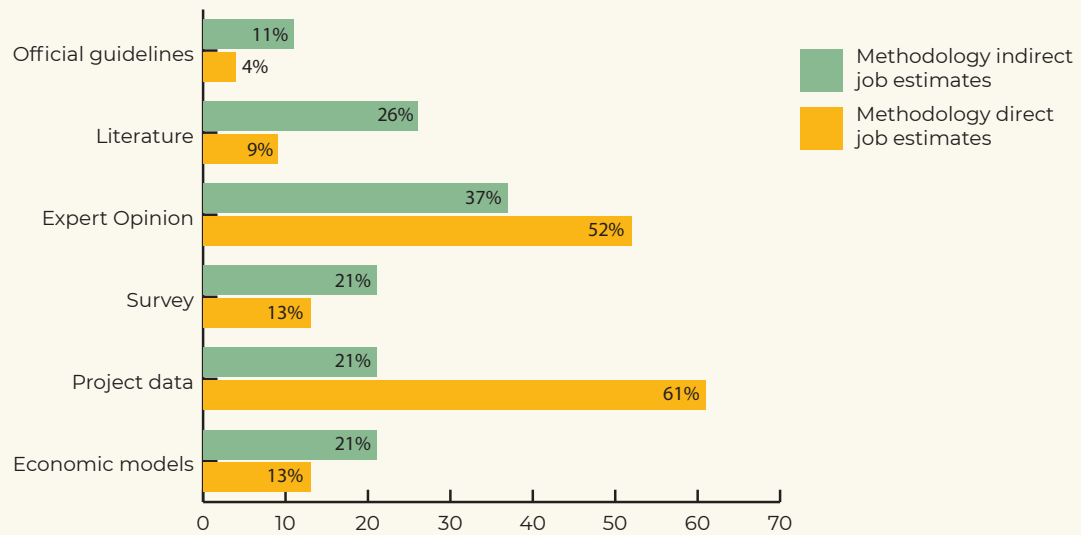
in the first year, while medium- and long-term employment is related to the maintenance of the restored areas. For Guatemala, Nello et al. (2022b) used both economic models and government data to estimate job creation. The available data in labour days/ha for each type of intervention were translated to FTE/year per intervention for the reporting years. Government statistics were used to estimate job creation by sex.

Two African countries that submitted data to the Barometer (Cameroon and Rwanda), used **project data** to estimate jobs created by FLR actions (IUCN-Rwanda 2021; Wayang et al. 2022). For example, in Rwanda 71 projects were identified for the period 2018–2021, and data from these projects was used to provide the **number of jobs** (IUCN-Rwanda, 2021). A key issue with project data is that not all projects will record job creation numbers. The number of direct jobs in restoration is thus often reported for a subset of total national restoration actions, including only projects in a given country that report on direct jobs created. Cameroon uses the project data to report the **number of jobs** created and distinguishes between short-term, long-term and seasonal employment. Ghana, on the other hand, uses an official government report (**literature**), as well as **project data** to report the number of people employed. In this report, a distinction is made between what is understood in the report as seasonal/casual jobs, short-term jobs (ranging from 1 to 48 months) and long-term (full-time) jobs.

The aim of the Restoration Barometer is to provide a reporting tool for impact of restoration actions already implemented. In addition, future job creation impacts have also been reported, for example as part of project proposals. In early 2022, FAO and UNEP, as co-leads for the UN Decade on Ecosystem Restoration, called for nominations for World Restoration Flagships under the UN Decade. As part of this process, 73 submissions for nominations were made to FAO by June 2022, of which 54 submitted estimates on the number of jobs expected to be created by 2030. A brief survey was carried out among a subset of those who submitted job creation data to get an overview of the methodologies applied to estimate direct and indirect jobs, as well as the units used.

The figure shows the percentage of respondents that applied a specific methodology to estimate direct and indirect jobs. Many respondents used more than one methodology. Project data and expert opinion were most often applied to estimate direct jobs, whereas expert opinion and literature were most commonly used to estimate indirect jobs.

Figure: Methodologies used to estimate direct and indirect jobs (percentage of respondents)



The table shows the different units used by the respondents to report job creation. Most respondents used only a single unit.

UNIT USED ²⁵	PERCENTAGE OF RESPONDENTS USING UNIT FOR:	
	DIRECT JOBS (%)	INDIRECT JOBS (%)
Number of persons employed ²⁶	47.8	31.6
FTE	21.7	15.8
Working days	17.4	31.6
Number of positions	8.7	10.5
Number of jobs	8.7	21.1
Number of people benefited	4.3	5.3
Person-days in a year	4.3	5.3

Final remarks

There is an increasing effort to understand and estimate job creation from landscape restoration. However, no standardized methodologies exist and, even when reporting tools exist, there is a wide variety of units used. This not only makes comparing actions and their job creation impact difficult, it also complicates the development of a global database of restoration actions and their (potential) contribution to job creation. Especially for project reporting, a set of standardized reporting options would facilitate this effort. In addition, there is a need for further data collection on restoration and the development of models to estimate indirect and induced impact on a global level.

²⁵ No definitions for these unit concepts were used. The survey focused merely on the terminology used by the respondent to report on job creation.

²⁶ One respondent differentiated between part-and full-time employment.

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Author

Leander Raes (IUCN)

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