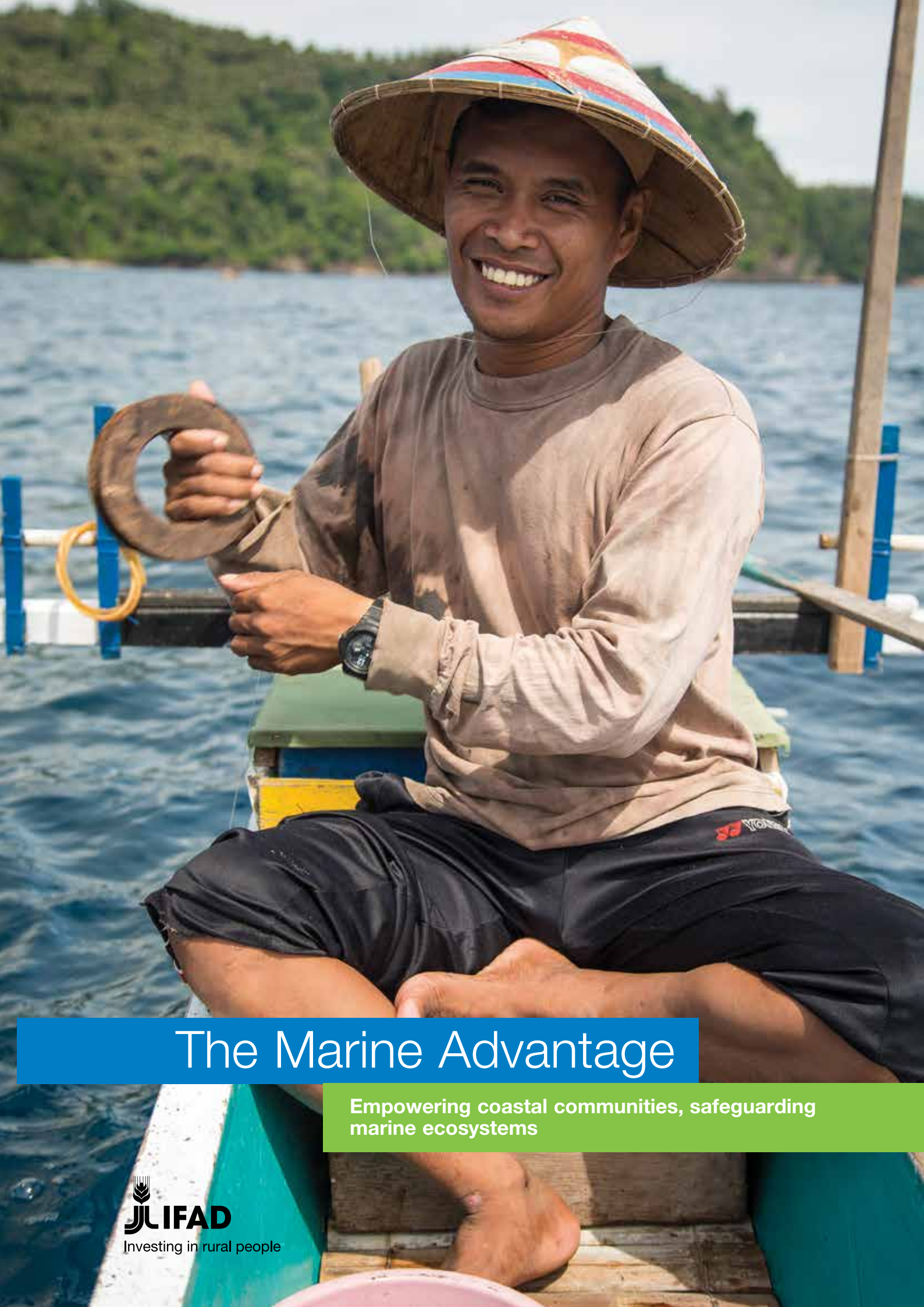

The Marine Advantage

Empowering coastal communities, safeguarding marine ecosystems

IFAD
Investing in rural people

"Agriculture in all its forms is central to inclusive and sustainable development and can contribute to national climate commitments. However, without appropriate measures, it can also damage marine ecosystems and fall short of its potential in terms of the climate. IFAD is uniquely placed to empower coastal communities, including on Small Island Developing States, in a way that contributes to eradicating hunger and poverty while protecting life below water."

President of the International Fund for Agricultural Development (IFAD),
Gilbert F. Houngbo.

The Marine Advantage

Empowering coastal communities, safeguarding marine ecosystems

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Acronyms

ASAP	Adaptation for Smallholder Agriculture Programme (IFAD)
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
MPA	marine protected area
SIDS	Small Island Developing State(s)

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Introduction

Agriculture and fisheries, the backbone of food security and nutrition for coastal communities and globally, are under threat. Climate change and environmental degradation in coastal areas, including Small Island Developing States, are already affecting the natural resource base on which smallholders depend for their food security and livelihoods. Future projections outline an increasingly urgent need to help communities adapt to these changes and protect these fragile resources.

In June 2017, the United Nations Ocean Conference in New York focused on Sustainable Development Goal 14 (SDG 14): conserve and sustainably use the oceans, seas and marine resources for sustainable development. The call for action is urgent and encompasses more support for small-scale and artisanal fishers in developing countries to enhance their access to marine resources and markets to improve the socio-economic situation of fishers and fish workers within the context of sustainable fisheries management. However, as this report highlights, the interconnected nature of the challenges facing us today mean that achieving SDG 14 also depends on empowering coastal and island communities through environmentally friendly land-based agriculture.

Unsustainable agriculture and fisheries

The unsustainable use of natural resources on land exacerbates climate threats and results in the degradation of marine and coastal ecosystems. As people struggle to cope with climate change and exclusion from access to land and critical production factors, they resort to surviving on what they can access – including using means that harm the environment. Ultimately, environmental degradation of marine and

coastal resources makes it even harder for people to access critical ecosystems services. For example, unsustainable fishing practices destroy corals and deplete fish stocks, and the cutting down of mangroves for their wood or for land reclamation purposes mean that they are less able to buffer impacts of cyclones and other extreme events, sea-level rise, wave action and coastal erosion.

But what happens on land directly impacts what happens in oceans, and the inappropriate use of harmful substances to fertilize and protect crops on land results in harmful chemical run-off into coastal waters. Unsustainable land-based agriculture, therefore, undermines peoples' options to diversify their livelihoods and protect marine resources. For smallholders, this ultimately translates into even greater food insecurity and ever-more fragile livelihoods.

The climate challenge

"Human societies depend on marine ecosystem services, which are sensitive to climate change (*high confidence*), in particular the provisioning of food (fisheries and aquaculture) and other natural resources; nutrient recycling; regulation of global climate including production of oxygen (O_2) and removal of atmospheric carbon dioxide (CO_2); protection from extreme weather and climate events; and aesthetic, cultural, and supporting services." (Intergovernmental Panel on Climate Change, 2014a)

Major threats arising from climate change include rising sea levels and extreme weather as well as flooding, which in turn lead to a number of further, interconnected problems. Rising sea levels have been highlighted by the Intergovernmental Panel on Climate Change (IPCC) as one of the most pressing threats arising from climate change. Consequences for smallholders and rural communities include the following:

- loss of fish stocks as they move due to temperature changes and to follow their food
- loss of agricultural land due to flooding, coastal erosion or intrusion of saltwater
- lack of clean freshwater resources, as well as related health and nutrition risks
- loss of biodiversity, including due to degradation of coral reefs and mangroves
- migration and conflict over precious resources
- even greater vulnerability of small-scale fishers with small boats to storms
- reduced number of days at sea for small fishers with small boats and low-technology equipment
- increased risk of small fishers due to lack of risk management tools such as insurance and weather forecasts.

In many areas, vulnerability to extreme weather events and flooding is also expected, with consequent loss of lives and livelihoods. For smallholders relying on fisheries and aquaculture, climate change presents significant challenges. Oceans are becoming warmer and may affect nutrient recycling and productivity of fisheries. Fish migration paths could change, affecting small-scale fishers without suitable vessels to follow migratory species. Increased spread of disease, reduced oxygen and increased risk of toxic algal blooms and fish kills will impact on aquaculture production.

Oceans are also becoming increasingly saline and acid, affecting the physiology and behaviour of many aquatic species and altering productivity, habitats and migration patterns. For example, more acid seawater means that zooplankton cannot create their calcareous shells, leading to less zooplankton, which affects the species higher up in the food chain that feed on them.

Sea-level rise combined with extreme weather events such as stronger storms severely threatens coastal communities and ecosystems. Low-lying coastal area mangroves will be particularly affected, including fish nursery grounds. Higher water tables and drainage problems may affect brackish water aquaculture and cause the destruction of fishing and aquaculture assets. There may be fish escapes, increasing the risk of disease and parasitic infestation of wild stock, as well as impacting biodiversity. The catch of warmer water species has increased at higher latitudes, while catches of subtropical species have decreased. These changes have negative implications for small-scale coastal fisheries in tropical countries, where the majority of people involved in capture fisheries are employed; their food security is being eroded by smaller catches and lower incomes.

Another major problem is the phenomenal amount of litter and plastics that ends up in the sea. An estimated 8 million tons of plastic enters the ocean every year (Jambeck et al., 2015) and around 5 trillion pieces of plastic are afloat on the ocean (Eriksen et al., 2014). This, in turn, ends up in fish and is very detrimental to human health.

IFAD solutions: integrated approaches for planet-people impacts

The International Fund for Agricultural Development (IFAD) is working to build the resilience of smallholder livelihoods and food security in coastal areas in the face of the threats outlined above. In doing so, IFAD is also committed to maximizing contributions to climate goals (Sustainable Development Goal 13), as well as environmental gains related to several other SDGs, in all its investments. IFAD believes that in order to protect coastal communities and marine ecosystems, a holistic approach is needed.

In concrete terms, this means that different combinations of approaches, including those outlined in the table, are employed in different contexts. Such integrated systems also need to be sensitive to local conditions affecting rural people and receptive to local and traditional knowledge. In the current context, where the impact of climate change on the ecosystems and the natural resource base is dramatically increasing, adoption of location-specific integrated management of natural resources for higher productivity and better resilience to erratic climatic events is becoming even more crucial.

Table 1: Examples of IFAD solutions for coastal areas and marine ecosystems

Strategies	Challenges tackled						
	Land and ecosystem degradation/ Biodiversity loss/CO_2 emissions	Impact of hurricanes, tsunamis and typhoons	Flooding	Livelihoods/ Food security, or nutrition damage	Lack of water	Saltwater intrusion	Sea-level rise
Conserving/restoring mangroves and natural buffers	X	X	X	X			X
Seaweed harvesting	X			X			
Coastal cleaning	X						
Cyclone shelters/ schools		X	X				
Resilient infrastructure		X	X	X			X
Drainage schemes			X	X			X
Salt-tolerant strains of fish				X		X	
Drought-tolerant strains				X	X		
Water management and irrigation	X			X	X		
Sustainable agriculture, including conservation agriculture, etc.	X	X	X	X	X		
Sustainable fisheries	X			X			
Institutional support (e.g. fostering community-based ecosystem management and co-management of resources)	X	X	X	X	X	X	X
Policy engagement	X	X	X	X	X	X	X

Box 1: Seaweed's transformational potential

On the island of Zanzibar, the sea had always been a man's domain. Fifteen years ago, women on Zanzibar island off the coast of Tanzania could do nothing without asking permission from their husbands. Change came from a surprising place – the sea. When they saw an opportunity to earn their own income from farming seaweed, which also has potential for CO_2 sequestration, women wanted to grab it, although it was a struggle to get their husbands to agree.

Researcher Flower Ezekiel Msuya says that today, these women are earning well and some have even bought new fishing boats for their husbands.

Source: Adapted from IFAD AgTalk "Seaweed power". 2016.

©IFAD/Flavio Ianniello

IFAD also watches for opportunities, albeit fleeting, afforded by the changing climate. For example, seaweed farming requires relatively few inputs from poor farmers, and potentially offers carbon sequestration opportunities at the same time. See Box 1 for an example of how such opportunities have empowered women in Africa.

Special focus on Small Island Developing States

Small Island Developing States, or SIDS, including their coastal areas, face specific challenges and are very much on the front-line of climate change. The issues of environment and climate change are therefore priority thematic areas for IFAD in SIDS. Other thematic focus areas are sustainable small-scale fisheries and aquaculture, because of generally abundant marine resources, and expanding opportunities and employment for smallholder agriculture (IFAD, 2014a). A lack of agricultural land in SIDS means that strategies also need to include making the best possible use of what is available, as well as taking better care of this precious resource for future generations. IFAD can also draw on its experiences in other areas, and on guidelines such as those regarding how to integrate climate change dimensions into sustainable fisheries actions (IFAD, 2014b). See Box 2 for examples of multiple benefit solutions proposed in these guidelines.

Box 2: Multiple benefit solutions to integrate climate change into fisheries and aquaculture investments

Climate challenge: increase climate resilience of small-scale fishers and farmers

- Reduce overfishing
- Implement an integrated ecosystems approach to fisheries and aquaculture management
- Establish natural resource co-management regimes involving community groups, fishers and fish farmers' associations
- Strengthen the knowledge base and climate change advisory capacity of fishery and aquaculture extension workers
- Invest in key infrastructure and ecosystem rehabilitation projects, adopting a "no-regrets" approach
- Encourage diversification of livelihoods and income sources
- Invest in research to identify new commercially viable strains of aquaculture species tolerant of low water quality, high temperatures and disease
- Promote integrated aquaculture and agriculture systems, including using flooded/saline land and water bodies

Climate challenge: increase capacity to manage short- and long-term climate risks and reduce losses from weather-related disasters

- Establish early warning systems, safety-at-sea, and disaster risk management plans
- Rehabilitate coastal ecosystems that provide protection from storms and waves (e.g. mangroves, wetlands, marshes, coral reefs and seagrass beds)
- Increase access to financial services and insurance mechanisms
- Encourage small-scale fish nurseries to facilitate restocking after disasters
- Improve aquaculture development planning and zoning

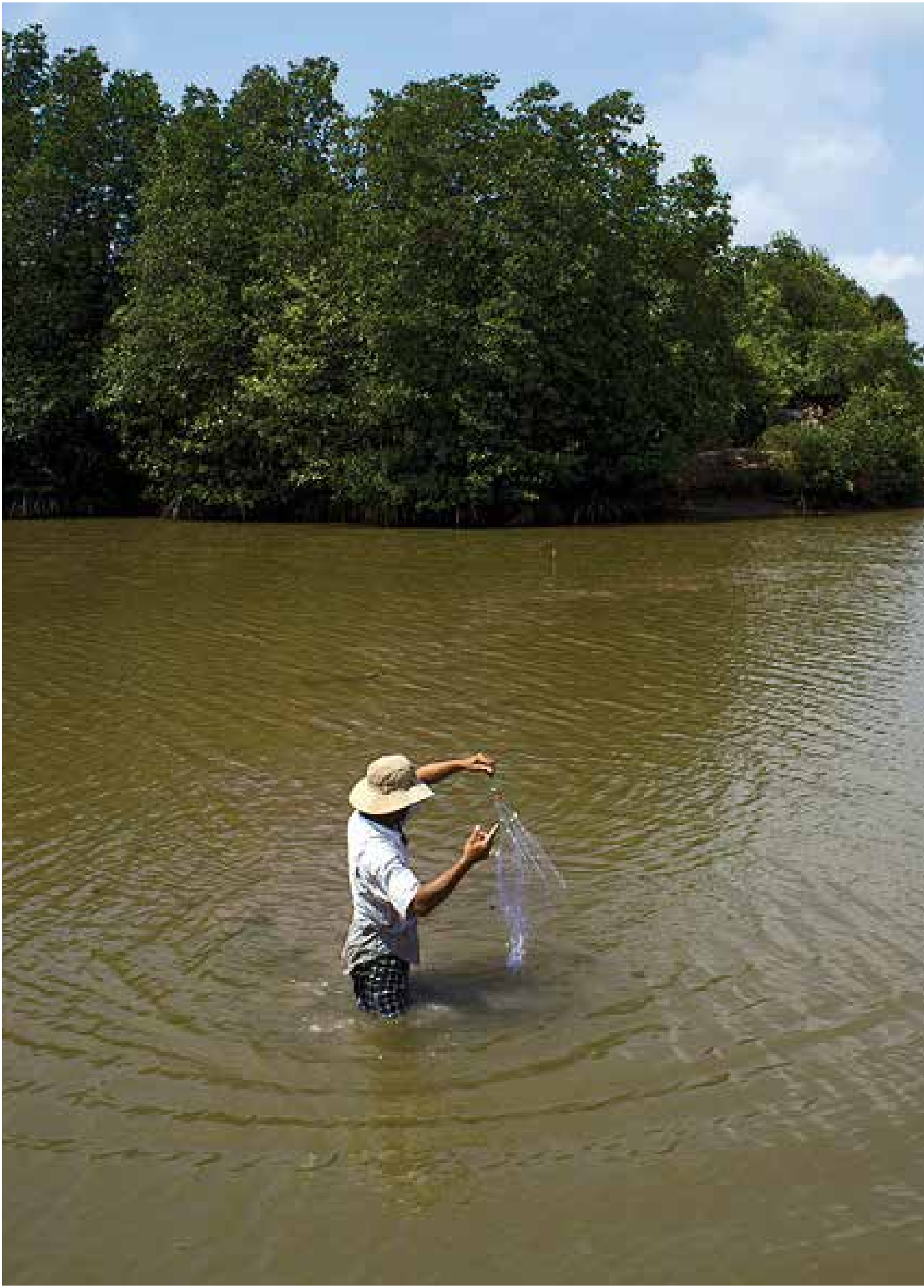
Climate challenge: reduce/sequester greenhouse gas (GHG) emissions

- Introduce more fuel-efficient boats and encourage the use of static fishing gear instead of damaging gear such as trawls
- Promote the culture of low-trophic-level species and aquatic plants in polyculture/integrated multi-trophic aquaculture systems
- Identify opportunities to access carbon finance for mangrove planting/restoration

Source: IFAD. 2014b.

In addition to the above thematic areas, IFAD will promote:

- a "ridge-to-reef" approach to ecosystem conservation, which links the planning and use of land resources with coastal zone management and protection
- an integrated vision for disaster risk management and climate change adaptation
- poor people's access to land and the management of increasingly scarce natural resources, while reducing the potential for conflicts
- the development of renewable energy sources capable of capitalizing on the natural resources of SIDS and reducing the significant costs associated with imports of fossil fuel
- appropriate insurance schemes.



Case studies

The following pages present five case studies of these approaches from **Comoros**, **Djibouti**, **the Dominican Republic**, **Indonesia's West Papua**, and **Sao Tome and Principe**. In Djibouti and Sao Tome and Principe, the IFAD-supported projects include a focus on protecting marine ecosystems, while Comoros and the Dominican Republic also offer examples of how IFAD interventions on land can help to reduce negative impacts on marine ecosystems. In line with IFAD's mandate, all interventions have a clear focus on supporting the livelihoods of coastal and SIDS communities, and West Papua is an example of how this can also potentially support climate change mitigation.

While these case studies illustrate IFAD's actions in different geographical areas, there are many other examples that also build on dedicated financing from the Global Environment Facility (GEF) and IFAD's Adaptation for Smallholder Agriculture Programme (ASAP). In **Mauritius**, for example, the GEF-supported Marine and Agricultural Resources Support Programme has supported coastal communities' livelihoods while promoting sustainable marine ecosystems management. In the **Philippines**, the Fisheries, Coastal Resources and Livelihood Project aims to reduce poverty in poor coastal communities, improve food and nutrition security, and support recovery from the devastating Haiyan typhoon. Recovery from disaster has also been a focus in Sri Lanka.[1] Meanwhile, in **Viet Nam** and **Bangladesh**, IFAD is working to address the impacts of rising sea levels and saltwater intrusion through salt-tolerant species and strengthening infrastructure, in addition to stronger governance and support for livelihoods diversification.

1 Bangladesh: the ASAP-supported Coastal Climate-Resilient Infrastructure Project. Sri Lanka: the GEF-supported Participatory Coastal Zone Restoration and Sustainable Management in the Eastern Province of Post-Tsunami Sri Lanka Project. Viet Nam: the ASAP-supported Project for Adaptation to Climate Change in the Mekong Delta in Ben Tre and Tra Vinh Provinces.

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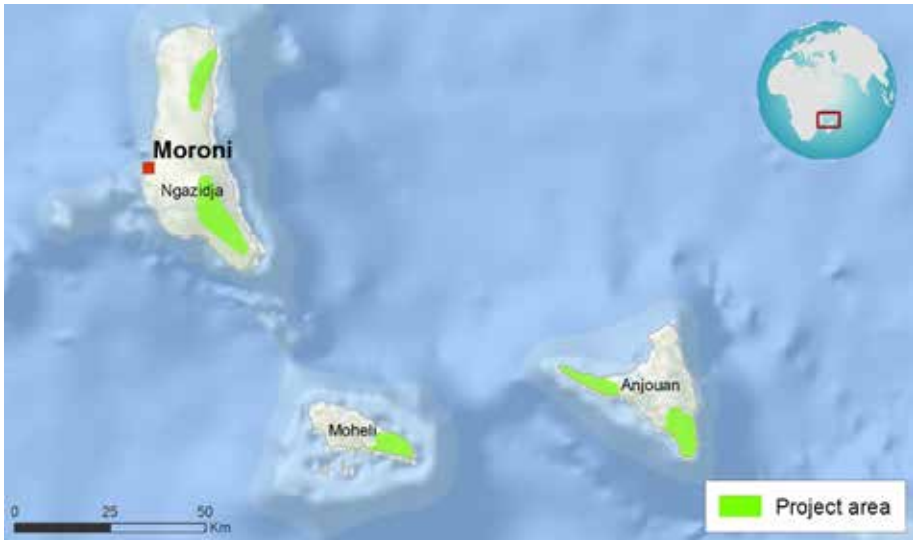
Comoros. Outreach for Integrated Coastal Ecosystem Management

Key facts

Project name	Integrated Ecological Planning and Sustainable Land Management in Coastal Ecosystems in the Comoros (in the three islands of Grand Comore, Anjouan and Moheli)
Dates	2008-2014
Financing	IFAD, Global Environment Facility, Government of Comoros, smallholders



As well as leading to more sustainable fisheries, promoting sustainable land-based agriculture benefits coastal areas.

Development challenges

The Small Island Developing State of Comoros is a biodiversity hot spot, and its marine coastal ecosystems and forests are on the World Wildlife Fund's list of the 200 ecoregions most crucial to biodiversity conservation. Despite the importance of the archipelago's biodiversity, coastal land erosion and silting of fragile lagoons is further threatening the islands' unique biodiversity, as well as the productivity of its agriculture and fisheries.

Large areas of its forest habitats are also degraded, due mainly to the conversion of forested land into agricultural land and to the demand for fuel; these practices increase soil erosion and cause downstream sedimentation, contributing to the loss of critical coastal and nearby marine habitats, such as coral reefs, seagrass beds and mangroves. Dynamite fishing and "reef gleaning", where fishers break down coral beds to collect invertebrate animals, leave behind fields of dead coral rubble.

A rapidly growing population and extreme poverty are major underlying factors driving these threats, and over time, climate change and sea-level rise is projected to exacerbate these impacts on the country's natural resource base and have an even greater negative effect on the country's already vulnerable agricultural and aquatic resources and their ecosystems.

Project responses

A recently completed GEF project aimed to support longer-term ecological restoration in the three islands of Gran Comore, Anjouan and Moheli. One component focused on improving policy and planning frameworks through an Integrated Ecosystem Management (IEM) approach designed to restore and protect biodiversity in the production area.

Another project component promoted the implementation of these plans, and the project also supported greater public awareness and strengthened local capacities to incorporate an ecosystems-based approach into programmes. The project was fully integrated into the IFAD-supported National Programme for Sustainable Human Development that was later taken up by the United Nations Development Programme.

Impacts

The project contributed to reducing land degradation trends by putting 1,052 hectares of land under sustainable land management practices and replanting 384 hectares of degraded forest in order to pave the way for livelihoods that do not draw on already stressed marine ecosystems. In addition, 4.5 hectares of mangroves in coastal areas were replanted.

Despite the fact that the project was not initially designed to address projected impacts of climate change in the country, a number of interventions have contributed to reducing the vulnerability of the natural resource base and livelihoods to climate-related threats. These include:

- better controlled and sustainable agricultural and fishing practices, which contribute to ecosystem management
- environmental restoration of degraded terrestrial and marine sites, as well as the application of soil and water conservation practices, which contributed to stemming the disappearance of reefs and beaches.

The GEF grant was also instrumental in commissioning a series of cartographic and feasibility studies for the creation of protected areas, including the "Feasibility study for starting a locally managed marine area (Anjouan)". The study provides a detailed ecological and socio-economic analysis of the Sima/Bimbini peninsula, and identifies conservation targets and areas with potential for alternative land use. The study also presents the benefits and challenges of locally managed protected areas, with key recommendations, including the need to establish a legal framework that empowers villagers as managers of protected areas, along with the need to reinforce the capacities of local organizations.

This exercise was complemented by an ecological and cartographic study for the protection of the Bimbini peninsula that both proposed legislation and regulatory mechanisms for protected areas and presented a detailed environmental analysis of the biodiversity status of the barrier reef, local mangroves and seagrass beds. One "lesson learned" was that agreed rules for areas under village management need to be supported by local government actions to sanction illegal activities, and that national actions are also needed to reflect conservation of precious ecosystems.

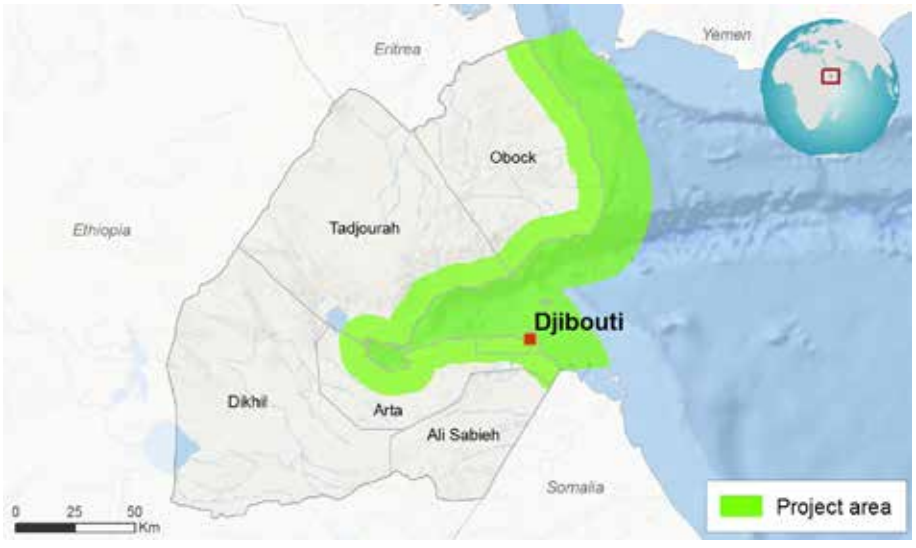
Extensive outreach and environmental education was a key strategy to build local capacities in sustainable livelihoods. For example, more than 200 people, a third of whom were women, took part in training on mangrove and reef protection. Local livelihoods were supported through the formation and capacity development of fisher groups, almost 200 of whom were trained in responsible fishing and sustainable management of marine resources. Overall, the project reached more than 37,000 people, and the Terminal Evaluation found that the project had temporarily checked trends in land degradation and yielded global environmental benefits.

©IFAD/PRAREV

Djibouti. Protecting marine ecosystems for sustainable fisheries

Key facts[2]

Project name	Programme to reduce vulnerability to climate change and poverty of coastal rural communities (PRAREV)[3]
Dates	2015-2020
Financing	IFAD, including ASAP, World Food Programme, Government of Djibouti, artisanal fishers



The PRAREV team visits Godoria, a highly degraded mangrove, to assess progress in removing dead wood and reforestation.

2 Case study previously printed in "The Biodiversity Advantage. Global Benefits from Smallholder Actions."
3 PRAREV: *Programme d'appui à la réduction de la vulnérabilité dans les zones de pêche côtière.*

Development challenges

The Republic of Djibouti boasts a coastline of more than 350 kilometres on the Red Sea, with biodiverse marine ecosystems in its mangroves, coral reefs and seagrass beds. But things are changing. A vulnerability assessment carried out using an innovative methodology for coastal multi-hazard assessment, the "coastal hazard wheel",[4] found that ecosystem challenges relate mainly to coral reefs and mangroves of local and global importance that may face increased human pressure and climate change threats. Other stretches of the coast are exposed to gradual flooding and saltwater intrusion. These coastal ecosystems are being undermined by a combination of human and environmental factors; recurrent droughts and conflict have contributed to increasing human pressures from people moving to coastal areas. Rising temperatures and sea levels resulting from climate change are likely to exacerbate these processes with further dramatic consequences for ecosystems.

The national hazard projections for ecosystem disruption are shown below. Most of the red areas (*very high* hazard) are related to coral reef ecosystems; nearly half of Djibouti's coast has a very high/high hazard of ecosystem disruption.[5] For example, temperature increases cause coral bleaching, as well as reducing biodiversity. Mangroves, which are well known to be rich in biodiversity and a natural buffer against tides and erosion, are also likely to be threatened because of both climatic and anthropogenic variables.

Figure 1: Ecosystem disruption hazards map for Djibouti

Source: Multi-hazard assessment for the coastline of Djibouti in a changing global climate. (UNEP Risoe Centre, 2013)

4 See "Application of the Coastal Hazard Wheel Methodology for Coastal Multi-hazard Assessment and Management in the State of Djibouti". (Appelquist and Balstrøm, 2014).

5 Very high 41 per cent, high 7 per cent, moderate 11 per cent, low 41 per cent. Source: Evaluation carried out during project design.

All this has serious consequences for people. Sea-level rise and extreme weather events, such as storms and floods, damage coastal infrastructure, including production and processing equipment for fish, and fishers lack the equipment and skills to keep up with the changes. Climate change is also causing long periods of drought, as well as increasing temperatures along the coast. This affects groundwater recharge, the main source of freshwater in the country. The combination of rising sea levels and reduced groundwater recharge is increasing the intrusion of seawater, which affects the quality and availability of freshwater.

Project responses

PRAREV is working to protect Djibouti's coral reef system and mangroves, and to expand options for sustainable artisanal fishery livelihood systems, especially for women and young people. One component focuses on assessing the impact of climate change on coastal habitats and marine ecosystems, while supporting the resilience of marine and coastal areas, including maintaining water quality.

Impacts

Specific actions include the following:

- A coastal zone co-management system and participatory plans are being developed to restore coastal habitats affected by climate change; these will engage and benefit communities through employment linked to rehabilitation, including women's groups.
- Long-term monitoring for coastal ecosystems is important. Monitoring of marine biodiversity encompasses coral reefs, endemic species, preservation of sea turtles, and marine protected areas; mini-observatories were financed by PRAREV to support this objective.
- Studies on mangroves and the status of coral formations have been finalized and presented to all stakeholders. The studies act as project baselines and inform national baselines for key coastal ecosystems.
- Capacity development in conservation and sustainable fishing for fishers and local communities includes a focus on avoiding overfishing, respecting the minimum size of fish caught as well as protected species. Training at the Centre for Development Studies and Research (CERD)[6] also builds national capacities in assessing inventories of fish stocks and understanding the dynamics of fish populations, water quality and coastal biodiversity. Furthermore, recognizing the importance of investing in people over the longer term, the project will invest in master's programmes for two CERD staff. CERD staff will also be learning through their contribution to project-supported studies, such as on the impact of climate change on marine ecosystems.
- Vulnerable people relying on degraded coastal resources will be supported through climate-resilient infrastructure. PRAREV will invest in fishing infrastructure, renewable energy equipment, ice plants and coolers/insulated containers to improve the conservation of fish products. This will help to protect fisheries value chains affected by climate change.

6 CERD: *Centre d'Études et de Recherche pour le Développement.*

- The conservation of the Godoria mangrove ecosystem is supported by PRAREV in collaboration with the World Food Programme and the local fisher association is undertaking a number of activities that will contribute to the conservation of the 200 hectares of mangrove ecosystem. These include removing dead wood (used at another site to stabilize sand dunes that threaten the health of the mangrove) and planting mangrove species. In one year of work, PRAREV cleaned 2.14 hectares of mangroves and replanted 1.04 hectares of mangrove. Dune stabilization is under way through the installation of a barrier over 700 metres long of dead wood. Two thousand plants of *Parkinsonia*, *Tamarix*, *Conocarpus* and doum palm were planted at the site.

©IFAD/Franco Mattioli

Dominican Republic. Marine and coastal co-benefits of enhancing resilience of poor rural families

Key facts

Project name	Project for Productive Inclusion and Resilience of Rural Families (PRORURAL INCLUSIVO)
Dates	2018-2024
Financing	IFAD, Government of the Dominican Republic, smallholders

Can more sustainable inland agricultural management help fishers and the coral reefs that contain their livelihoods? Only time will tell.

Development challenges

The Dominican Republic is classified as a SIDS, and frequently exposed to extreme climate events. Despite reforestation efforts in recent decades, the precariousness of its watersheds and unsustainable land uses exacerbate the impact of these events, which have been increasing in frequency in recent decades as a consequence of climate change. According to the Global Climate Risk Index, the Dominican Republic is among the 10 countries in the world most affected by climate change. Cyclones, floods and droughts are frequent: in recent years, agriculture has been impacted in two years out of every three. Small producers and poor landless families are the most vulnerable to these events.

As is the case globally, human activities in both coastal and inland areas, including inappropriate agricultural practices and deforestation, are threatening the productivity and biodiversity of coastal and marine environments in the country. Indeed, studies show worrying trends in terms of coral health and fish catch, impacting on a key livelihood activity for many (World Resources Institute, 2010).

In the Dominican Republic, the high levels of run-off and sedimentation and agrochemicals in surface waters are affecting coastal water resources and the livelihoods of coastal communities. Inadequate watershed management and agricultural practices lead to soil erosion, including in coastal areas, and increase the damage and frequency of flooding. Pollutants from agriculture enter groundwater, rivers, and eventually flow out to oceans as sediment and chemical loads, with negative impacts on coastal ecosystems and human health. There is consensus that more sustainable agricultural practices, along with addressing deforestation and land degradation, can help to reduce vulnerability to erosion, flooding and wave damage caused by hurricanes and severe tropical storms along coastal areas (World Bank, 2004).

Project responses

Covering the whole country, the project aims to increase vulnerable households' resilience, economic empowerment and their access to markets for products, services and employment. The target groups will be comprised of small-scale producer and landless families with high levels of poverty. A key strategy will be to support locally developed and managed investment plans, which will also promote better management of natural resources, specifically water, soil and vegetation cover.

This is aimed at increasing the resilience of households in periods of crisis, as well as their ability to recover after shocks. This approach is in line with the National Development Strategy (2012),[7] which aims for a sustainable production and consumption culture that equitably and effectively manages risks, as well as to protect the environment and natural resources and promote climate change adaptation.

As a key preliminary step, and in keeping with IFAD's "multiple benefits" approach for integrated approaches, the project design has assessed possible risks to the wider environment of such local investments, lands for agriculture. Experts have identified a clear need to develop strategies to mitigate potential risks from local investment plans, including the following:

7 *Estrategia Nacional de Desarrollo.*

- Erosion from agriculture in areas with fragile soils and on slopes
- Oil degradation caused by lack of crop rotation and intercropping
- Disease and chemical pollution of groundwater, from abuse of harmful pesticides
- Local investment plans with an irrigation element may not take into account the availability of groundwater or the need to protect water recharge areas and ensure vegetation cover in water basins
- Contamination of water from solid and liquid waste from agriculture.

Further baseline and geographical analyses will help to identify potential soil use and degradation issues arising from current uses, in addition to challenges in managing water resources, particularly for agricultural production, and in protecting sources (basins and aquifers). These analyses, along with broader socio-economic ones on the nature of peoples' vulnerabilities, will inform planned project actions and investment plans to reduce soil erosion, contribute to improved watershed management and reduce the use of pesticides.

While the main focus is to create and support sustainable livelihoods for poor rural families and reduce vulnerability to drought and floods, the planned actions – including improved pest management and sustainable land and water management – are also known to yield coastal environment co-benefits by reducing run-off and sedimentation as well as the pollution of water sources.

Impacts

At present the project results framework includes the following targets:

- Over 16,000 households adopting environmentally sustainable and climate-resilient technologies and practices
- Over 25,000 new jobs created
- Over 80 per cent of target households with better conditions to increase productivity.

While there are no plans to explicitly measure co-benefits to marine and coastal ecosystems, it is clear that more sustainable inland land use for agriculture and better watershed management is likely to help alleviate some of the current drivers of degradation in these ecosystems. This, in turn, will benefit coastal communities. Coastal communities can also benefit from local investment plans, which will be selected for financing based on a combination of factors to target the poorest and most vulnerable areas with potential.

©IFAD/Joanne Levitan

Indonesia. Saved by seaweed in West Papua

Key facts

Project name	Village Development Programme (formerly “National Programme for Community Empowerment in Rural Areas Project”)
Dates	2009-2018
Financing	IFAD, IBRD, Government of Indonesia, smallholders, World Bank

Hassan Basri Heremba and his family have discovered what a reliable income seaweed brings, with its potential CO_2 sequestration co-benefit, in Sisir village, West Papua.

Development challenges

Indonesia's coastal and marine sector is a significant productive asset. Healthy coral reef ecosystems are estimated to produce marine products worth on average US$15,000 per square kilometre a year, and are an important source of food and livelihoods for about 10,000 coastal villages. However, almost two thirds of Indonesia's coral reefs are threatened by overfishing. West Papua, one of the easternmost provinces of Indonesia, is rich in natural resources, including fisheries, but it also has one of the highest poverty rates in the country.

Although communities living along the coast are somewhat better off than those living in the highlands, thin social services coverage and a challenging institutional setting are two drivers of poverty. Other threats come from the changing climate and degradation of the oceans, combining to destabilize the marine resources upon which coastal communities depend.

Project responses

The Village Development Programme aimed to promote greater participation of rural people in development processes and support government efforts to improve local governance. It will also provide continued support from the first phase of the project to stimulate economic activity through seaweed farming. This initiative was part of a pilot to fund productive proposals developed by communities through a participatory planning process. Local communities and community-based organizations, including tribal groups, also participated in implementation and monitoring progress at the village level.

Why seaweed? Rich in nutrients, seaweed is used in everything from food such as sushi, to pet food, cosmetics and even adhesives. The industry is estimated to be worth over US$100 million in exports, and Indonesia is aiming to expand its market share. For the coastal poor in West Papua, seaweed farming is attractive as it is relatively easy, there is huge demand and the various stages of propagating, harvesting, processing and marketing offer opportunities for both men and women to get involved – an important consideration for IFAD. For both of these reasons, the IFAD national strategy for Indonesia includes a target to increase the marketed volume and value of sales of marine and agricultural products by 30 per cent.

But there is more. What makes seaweed especially attractive from an environmental perspective is its carbon sequestration potential. Although seaweed culture alongside marine aquaculture is not new, recent research from Australia suggests that the carbon sequestration potential of seaweed may have been underestimated.[8]

In addition to promoting seaweed farming as an environmentally friendly livelihood strategy, one additional project provision that also yielded marine co-benefits in terms of avoiding harmful chemicals run-off was compliance with the International Code of Conduct on the Distribution and Use of Pesticides. The project ensured that pesticides procured under the project did not include any classified by the World Health Organization as extremely hazardous or highly hazardous. All irrigation development under the project ensured that adverse impact on groundwater levels were avoided, and the rehabilitation of existing roads and

8 Trevathan-Tackett, S. M. et al., 2015.

upgrading of tracks include an adequate number of cross-drainage structures and the design thereof will be preceded by and otherwise take account of a review of local hydrology.

Impacts

Seaweed farming has brought the following benefits for people in West Papua under the project:

- economic security, with incomes tripled and quadrupled for many families
- better education, with families now being able to send their children to school and beyond
- better nutrition, where families have been supported in making better choices
- carbon sequestration co-benefits, although these have not been quantified given that this impact was not part of the initial design.

The IFAD video "West Papua: Saved by Seaweed" gives a short overview of things that have changed for the better for many.[9] In addition, the project contributed to reducing harmful chemical run-off from pesticide use on land-based farming.

Today, the success of the seaweed experience is being scaled up in another IFAD-supported project, the Coastal Community Development Project (CCDP), and the Australian government has also indicated interest in replicating aspects of this experience in its own programmes. The CCDP has already supported mangrove replanting, established sea protection areas and organized rubbish cleaning.

Looking forward, while the benefits in terms of poverty reduction, nutrition and carbon sequestration are appealing, IFAD will need to stay on top of emerging research in order to avoid potential risks, such as avoiding seaweed crop devastation from infections through promoting the farming of different varieties, and to ensure the maximum mitigation co-benefits, for example by promoting the cultivation of specific varieties. Ultimately, as the climate continues to change, IFAD will need to support coastal communities to develop new climate-smart strategies that yield both socio-economic and climate benefits.

9 Available at https://www.youtube.com/watch?v=97CGPC5MkQw

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Sao Tome and Principe. Buffer zone benefits in a SIDS

Key facts

Project name	Integrated Ecosystem Approach to Biodiversity Mainstreaming and Conservation in the Buffer Zones of Obo and Principe Natural Parks, an IFAD-GEF intervention within the Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme (PAPAFPA) and subsequently the Smallholder Agriculture Project (PAPAC)[10]
Dates	2012-2017
Financing	IFAD, GEF, Government of Sao Tome and Principe, smallholders

A fishing cooperative coordinates collection and sale of fish in Sao Tome (Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme).

10 PAPAFPA: Programme Participatif d'Appui à l'Agriculture Familiale et à la Pêche Artisanale; PAPAC: Projet d'Appui à la Petite Agriculture Commerciale.

Development challenges

In the Gulf of Guinea, separated from the African continent by a deep ocean, lie the islands of Sao Tome and Principe. Although one of the poorest countries in the world, the country is rich in globally outstanding ecosystems. They are home to high numbers of endemic species; there is an estimated 40 square kilometres of primary forest on Principe, and 240 on Sao Tome. The Obo and Principe Natural Parks were established in order to conserve this natural heritage, and today they cover a third of the country.

But today, coastal mangroves are highly threatened habitats. These fragile ecosystems are among the most biodiverse in the country and provide critical services, including natural protection against coastal erosion, and spawning grounds for fish and other marine species. Inevitably, the reduction of fish stocks in turn has a negative impact on the livelihoods of artisanal fishers. Mangrove degradation often leads to the proliferation of invasive and salt-tolerant vegetation, which further hampers the recovery of indigenous, slow-growing vegetation.

Unsustainable practices, such as fine meshes on fishing nets, and fishing with scuba diving equipment, are replacing traditional fishing techniques. These, together with overfishing, harm both the ecosystem's biodiversity and, ultimately, also fishing livelihoods by reducing available habitats for the very fish they need to catch. Professional artisanal fishermen are ageing, while a new generation of inexperienced fishermen is emerging. These fishermen do not hold official licences, and they engage in fishing to complement incomes from small-scale agriculture or other sources of revenue. As fish catches diminish, poor people are prompted to enter the forests to make ends meet – and a vicious cycle sets in.

Project responses

The project is promoting integrated ecosystem management, including increased incomes for poor farmers through environmentally friendly agricultural production in marine areas and mangroves within the buffer areas of the natural parks.[11]

The first base project (PAPAFPA) aimed to set up farmers' organizations in the buffer zones and provide communities living there with expertise and financial support for organic coffee, cocoa and pepper farming using appropriate methods. The project also builds on PAPAFPA's participatory approach to give stakeholders a voice alongside government agencies and private-sector companies involved in value chains. Since 2015, the IFAD-GEF intervention has been integrated into a successor project, which is building on initial successes in boosting incomes through sustainable production and private-sector partnership.

One component on integrated ecosystem management targets five co-management areas covering approximately 18,000 hectares in and around the buffer zones of these protected areas. A focus on responsible tourism seeks to boost sustainable employment opportunities by creating a "Tourism Platform" with new services

11 The main purpose of a buffer zone is to insulate areas where biodiversity conservation is the primary objective from potentially damaging external influences, and particularly from those caused by inappropriate forms of land use. This therefore allows for a range of sustainable human activities. Source: Review of Experience with Ecological Networks, Corridors and Buffer Zones. CBD. 2006.

and packages. The Platform has been designed with a strong partnership approach between government, civil society and private sector.

Impacts

- Working groups for terrestrial and marine biodiversity were established – although the marine working group did not become fully operational. The terrestrial working group meets every month. Learning visits, for example to Cameroon, have allowed government partners to see successful practices elsewhere. With the help of experts, the working groups carried out a study on biodiversity governance with recommendations on how to better integrate this issue into national policy. This work has indirectly contributed to a national strategy on biodiversity as the institutions in the working groups were also involved in developing the strategy.
- Two marine protected areas (MPAs), covering 2,000 hectares off the two islands of Sao Tome and Principe, have been identified and mapped together with an Italian NGO. The MPAs have been recognized by fishers and the Directorate of Fisheries. Today, institutional plans setting out their role and functions have been submitted for official approval, and support is being sought for the first action plan. The experience of mapping out the MPAs was in itself a learning process, and has stimulated the Directorate to already identify other potential areas (e.g. Santana). The Directorate has also taken the initiative of carrying out training in sustainable fishing and management of fish resources for 10 fishing associations.
- Policy actions include an evaluation of fish stocks around the islands, conducted with the support of the Directorate of Fisheries, and efforts to implement its recommendations. A study on fisheries regulations and a draft decree together with a proposed institutional framework on fisheries regulation were also produced. Although these did not become official, the process and content have been taken up by the Directorate, thereby contributing to institutional development.
- 240 hectares of mangroves are expected to benefit from improved management. So far, mangrove management committees have been set up for both mangroves targeted by the project, in Praia das Conchas and in Malanza. An NGO has trained managers and mangrove users, as well as tourism associations operating in mangrove areas.
- The Platform for sustainable tourism has been set up, and collaboration agreements are in place with local NGOs, the University of Lisbon, the Directorates of Fisheries, Forests, Natural Resources and Energy, Obo Natural Park, and Tourism. The Platform brings together 40 tourism operators and, as well as receiving some support from the GEF, it collects monthly contributions from members. In partnership with an Italian sustainable certification organization,[12] it developed a "Cocoa Route" which allows visitors to learn about cocoa production and engage with local communities.

12 *Istituto per la Certificazione Etica ed Ambientale.*

Socio-economic impacts include the following:

- 26 community micro-projects have been identified for investments, reaching about 40 communities in five co-management areas. These projects were identified during the formulation of the co-management plans.
- Twelve micro-projects are being implemented through three cooperatives established under PAPAFPA. The Cooperative for Quality Cocoa exports (CECAQ), for example, is implementing an innovative project to transform cocoa pulp, a by-product of cocoa processing, into jelly for sale in local mini-markets and for distribution to schoolchildren because of its nutritional value. Some projects are piloting organic robusta coffee plantations in humid areas, which offer few other income-generating opportunities (Colonia Açoreana and Santa Catarina). The Cooperative for Export and Market of Organic Cocoa (French acronym "CECAB"), which was created under PAPAFPA with IFAD, an NGO and private-sector support, has also been successfully renovating cocoa plantations.

All this translates into better livelihoods for CECAB's 34 associations and more than 2,000 members, including almost 700 women household heads. This helps to reduce their need to encroach on resources in the national park, including on marine resources.

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Looking ahead: delivering on Agenda 2030

Agenda 2030 is a driving influence for IFAD's investment approach, and IFAD is well placed to deliver on SDG 14 regarding "life below water" as part of its mandate and strategic thrust to achieve inclusive and sustainable rural transformation. Box 3 shows how IFAD contributes to specific SDG 14 goals, and the previous pages also highlighted related co-benefits of IFAD's land-based approaches.

Learning and challenges

Learning from experience in order to deliver on Agenda 2030 is an IFAD priority. And indeed, working to protect coastal communities as well as marine and coastal ecosystems is not without challenges for IFAD. For example, many projects face implementation challenges. This may be partly because ministries other than IFAD's traditional agricultural partners are often responsible for implementing projects. IFAD needs to build new relationships and promote a coordinated approach with new partners, especially as it aims for 100 per cent environment and climate mainstreaming in its projects. IFAD's experience in SIDS has also encountered institutional structural problems and weak project implementation capacity, which evidences the need for IFAD to support the strengthening of the institutional and project implementation capacity in its investments.

Another challenge is that most IFAD investments do not explicitly capture the marine and coastal environmental benefits of more sustainable land-based agriculture, such as reduced pollution. A recent evaluation of IFAD support for environment and natural resources management (IFAD, 2016a) found that relatively

Box 3: IFAD's contribution to Sustainable Development Goal 14

Goal 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Goal 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Goal 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

Goal 14.7: By 2030, increase the economic benefits to Small Island Developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

Goal 14.9: Provide access for small-scale artisanal fishers to marine resources and markets

little IFAD financing went into fisheries and marine conservation. However, investments in soil and water conservation and integrated pest management, especially in coastal areas and on islands, may well have relevant co-benefits that have not been captured. This means that the extent of such co-benefits of IFAD's portfolio is not fully captured today. Such assessments are complex in nature, but as an immediate measure IFAD will look into the possibility of tracking whether its projects are likely to contribute positively to marine and coastal ecosystems.

Increased investments

In order to achieve its ambitions, IFAD's Strategic Framework for 2016-2025 (IFAD, 2016b) confirms that through ASAP, GEF and the Green Climate Fund, IFAD will continue to expand the promotion of sustainable and climate-resilient agricultural practices, and in so doing, enhance its contribution to carbon sequestration benefits. This includes increased attention to better analysis of climate risks and vulnerabilities using state-of-the-art approaches (e.g. in Djibouti) and improved analysis of the climatic risks faced by individual countries, such as weather-related disasters and sea-level rise. IFAD has also invested in more technical expertise in fisheries, as an important potential growth area for poor communities with additional nutrition and climate co-benefits.

These investments will enable IFAD to further strengthen the resilience of coastal and small island communities while maximizing environmental and climate outcomes for marine and coastal ecosystems.

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Cyclone-prone SIDS

Remote Hunga Island in Tonga seems to be a paradise, but cyclones and drought are taking their toll on the environment, and indeed Tonga is one of the most vulnerable countries in the world to climate change.

That is why the IFAD-supported Tonga Rural Innovation Project Phase II (TRIP II) will trial different planting patterns and species mixes to identify tree species, which provide multiple benefits, including climatic tolerance, cyclone resistance, timber and other products of economic value. For example, plantings of feta'u trees may be trialled on the outer islands, as they tolerate a wide climate range, are cyclone-resistant, provide excellent coastal protection, produce nuts, which are a source of valuable oil for medicinal and cosmetics, and excellent timber. The project will also promote more resilient livelihoods based on climate-resilient, nutrition-sensitive sustainable agriculture production systems.

Source: Final Project Design Report (2017).

ASAP Donors and Partners

IFAD's Adaptation for Smallholder Agriculture Programme (ASAP) is a multi-donor programme that helps smallholder farmers cope with the impacts of climate change so they can increase their resilience.

As of 1 October 2017, the total commitments from ten donor countries (Belgium, Canada, France, Finland, Netherlands, Norway, Republic of Korea, Sweden, Switzerland and United Kingdom) amount to US$366,498,858 (subject to market currency fluctuations).

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