

Mangrove conservation is protecting both livelihoods and carbon stores

In Kenya, research supported by the Ecosystem Services for Poverty Alleviation (ESPA) programme has enabled local people to conserve their mangroves in exchange for community development projects, in a scheme that is impacting both Kenyan and international policy.

Key messages

- Mangroves are highly efficient at capturing carbon, much of which ends up buried below ground and is stored away from the atmosphere.
- The initiative researched the mangroves' total potential to store carbon below ground, and the vulnerability of this carbon if the mangroves were cut.
- The team quantified the amount by which carbon dioxide emissions increased when mangrove trees die, and then an associated conservation scheme, known as *Mikoko Pamoja* ('mangroves together'), engaged communities to restore thousands of new trees along the coastline. This meant the community could apply for accreditation to sell carbon credits through the voluntary carbon market, receiving an income for their conservation.
- The sale of carbon credits has now raised US\$52,758 and is funding new conservation and community projects.
- Further research found that seagrass meadows also store carbon, presenting new conservation opportunities.

Context

Mangroves are critical assets for villages such as Gazi, Kenya. Like forests on land, they provide wood for fuel and building. They act as a nursery ground for fish, protect the coastline from erosion and storm damage, and are of global importance as carbon stores. Even more than terrestrial forests, they help mitigate against climate change by removing carbon from the air and storing it.¹ ESPA research set out to investigate and quantify the mangroves' capacity for carbon storage below ground.

About the research

In a global first, an ESPA-supported project advanced scientific understanding of mangroves' potential to store carbon below ground and the vulnerability of this carbon (to atmospheric release) following damage to or loss of mangrove forests. The project did so while also developing practical approaches to mangrove protection, through the sale of carbon credits. It used the new science to contribute to technical specifications for carbon market accreditation.



Mangrove reforestation efforts in Vanga Bay, on the Kenya-Tanzania border.

Photo credit: Steven Lutz for Blue Forests

The team quantified the amount by which carbon dioxide emissions increase when mangrove trees die.² They did so by studying a set of five plots where trees were girdled and cut, alongside a set of control plots at the same site. They also measured tree growth under different environmental conditions and the impact on fauna to understand how recovering forests help to support associated wildlife, and then extrapolated these results to give an estimated value for the forest as a whole.

Results

The team was able to demonstrate the degree to which conserving – and planting – mangroves can store greenhouse gas emissions. These emissions would otherwise be released if villagers cut mangroves to support their livelihoods. In order to compensate the villagers for forgoing use of the mangrove forests, the research team explored whether it would be possible for them to be paid for conservation.

Using the data, a newly established community organisation, *Mikoko Pamoja*, applied for, and received, accreditation to sell carbon credits from Plan Vivo, which requires schemes to show long-term sustainability and benefit to people's livelihoods and vital ecosystems.³ All income from these sales is re-invested in local projects and continued conservation. The work contributes to Kenya's national plan for REDD+ (reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries).

The initiative employed scientists from the Gazi-based Kenya Marine and Fisheries Research Institute, local residents and volunteers from the international non-governmental organisation Earthwatch, and restored thousands of new trees over 615 hectares of coastline.

Impact and next steps

The sale of carbon credits to individuals and organisations has now raised US\$52,758 and is funding forest conservation and local community projects. Following consultation with the local community, a village council was established to set the project's spending priorities. To date, these have included:

- new water pumps and distribution points (supplying 75% of the area's population);
- the development of a new school building (benefiting 600 children);
- new textbooks and furniture for local schools;
- the sponsorship, through primary, secondary and tertiary education, of dozens of local children.

Mikoko Pamoja partnered with the national Kenya Forestry Service and informed Kenya's National Mangrove Ecosystem Management Plan (2017-2027) as an example of how carbon sequestration can generate



I am a witness of how such community projects could provide triple-win situations of combating the impacts of climate change, biodiversity conservation and livelihood improvements.



Dr Michael Njoroge Githaiga, who achieved his doctorate with ESPA support while working on *Mikoko Pamoja*

income for the community. The Kenyan government showcased it at the United Nations Climate Change Conference COP22⁴ in Marrakesh and the 2016 Regional Forum on Blue Solutions for Oceans, Coast and Human Wellbeing in Africa.⁵

Key to *Mikoko Pamoja*'s impact is the way that it helps Kenya's government visualise the value of mangroves. Using satellite images, the research team mapped the carbon-market value of the Gazi region and across all of Kenya's mangroves, to help policy-makers see conservation priorities at a glance. It reveals the risk factors, such as proximity of the groves to roads and hotel developments, to show which ones are under the most pressure and which ones have the most carbon and thus the highest climate change mitigation value.

To encourage learning, ESPA established the East African Forum for Payments for Ecosystem Services (EAFPES) with World Wide Fund for Nature (WWF) Kenya, where members can exchange lessons on related projects across Africa. ESPA also funded the training of local scientists, who have progressed to the Kenyan government and academic positions.

New opportunities for seagrass meadows

The research team continues to explore opportunities for carbon sequestration, turning its attention to the potential of seagrass meadows. The dense canopies of seagrass meadows reduce water flow velocity, trapping sediment from the water column. This stored organic carbon, which may be hundreds to thousands of years old, risks being released back to the atmosphere if the meadows are damaged or degraded.

ESPA research found that the sediment organic carbon constituted over 97% of total organic carbon, compared to less than 3% contributed by the biomass, while the presence of seagrass enhances sediment carbon stocks by a factor of four to six, depending on the species.⁶ In Gazi Bay, much of this organic carbon (in sediment) was found to have been transported from mangrove areas.

This project pioneered research on African seagrass sediment, and is contributing towards understanding the role of seagrass in global carbon dynamics. It also found that seagrass meadows are vulnerable to fishing methods like dredging and trawling.⁶ There are considerable challenges to protecting seagrass, as fishermen are not always local or engaged in community conservation efforts, and it is difficult to get a baseline for carbon accreditation as satellite images are often unavailable. Instead, the team is working to include seagrass conservation as a 'co-benefit' of mangrove conservation.

Expanding into Vanga

The community at Vanga on the Kenya-Tanzania border has initiated their own mangrove project modelled on *Mikoko Pamoja*. The Vanga mangroves sustain a community about three times the size of Gazi, with high levels of poverty. Local stakeholders worked with *Mikoko Pamoja* to develop their project proposal and received funding from various donors, including the Leonardo Di Caprio Foundation, to start in July 2018.

Entering the REDD+ conversation

Building on experience from *Mikoko Pamoja*'s input to Kenya's REDD+ contributions, the research team is involved in an international conversation on REDD+. They are making a case for bilateral and multilateral donors to invest in mangrove conservation and are supporting an event for the REDD+ Exchange conference in Norway in June 2018.

More information

- The *Mikoko Pamoja* project won the United Nations Equator Prize 2017, for its innovative solutions for tackling poverty, environment and climate challenges.⁷
- The project was part of the winning display for the President's prize at the Mombasa International Show in 2016.⁸
- The initiative was featured in the UK Collaborative on Development Sciences of the 20 most impressive examples of UK research contributing to development.⁹



***Mikoko Pamoja* is an innovative project that has shown that a local mangrove conservation scheme can have positive sustainable development impacts by way of protecting threatened ecosystems and improving the livelihoods of local community members.**



Eva Schoof, Programme Manager, Plan Vivo



Interviewing a community member as part of a social survey in Gazi.

Photo credit: *Mikoko Pamoja* project

About the projects

Mikoko Pamoja and the associated scientific research was supported by ESPA through three projects, all led by Edinburgh Napier University. 'Capacity-building for mangrove assessment, restoration and valuation in East Africa' (NE/G008078/1, 2009-2010) developed local expertise to conserve and restore mangroves in East Africa. The 'Swahili Seas' project (NE/I003401/1, 2010-2013) conducted further research into the economic value of Kenyan mangroves, and mapped out areas under high threat and with high value for policy-makers to assess priorities. 'Coastal ecosystem services in East Africa' (NE/L001535/1 – 2013-2017) assessed the carbon density of seagrass meadows and opportunities and barriers to conservation.

Credit

This briefing was written by the ESPA Directorate based on information provided by the *Mikoko Pamoja* project team.

About the ESPA Programme

ESPA is a global development research programme established in 2009 with funding from the Department for International Development (DFID), the Natural Environment Research Council (NERC) and the Economic and Social Research Council (ESRC). ESPA is one of the most comprehensive research programmes exploring the linkages between ecosystem services and human wellbeing. ESPA aims to provide new worldclass research evidence demonstrating how ecosystem services can reduce poverty and enhance wellbeing for the world's poor.

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Endnotes

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