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Enhancing Resilience through Marine and Coastal Ecosystem-based Adaptation

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Recommendations

- Improve regional institutions and national policy audiences' understanding of the role of marine and coastal EbA in enhancing climate resilience.
- Provide a stronger evidence base to support the inclusion of marine and coastal EbA in national climate policies and strategies.
- Fully integrate EbA into national and sectoral policies, as well as budgetary and regulatory frameworks of climate change response measures.
- Enhance the emphasis on marine and coastal EbA in NDCs updated by the 2020 deadline specified by the UNFCCC.
- Increase knowledge and action within the policy community and the private sector around opportunities for innovative financing and investment to support marine and coastal EbA.
- Promote peer learning and share national and regional EbA best practices.
- Equip community-based organisations with the skills and information to actively participate in EbA policy and project design and implementation.

African perspectives
Global insights

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Executive summary

Marine and coastal ecosystem-based adaptation (EbA) is the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change. Coastal and marine EbA involves governing and managing ecosystems to enhance their resilience to climatic stresses in the coastal zone. This entails maintaining and, where possible, improving the quality and quantity of ecosystem services provided to society; and in so doing supporting communities to adapt to current and future climate risks. As a result more sustainable forms of development will be achieved, strengthening livelihoods in ways that reduce poverty and environmental degradation.

African countries safeguard many of the world's planetary boundaries and healthy ecosystems.[1] However, despite the recognition of their value, the modification and degradation of crucial habitats such as coral reefs, mangrove forests and coastal wetlands continue unabated. Moreover, these ecosystems are still largely absent from climate change response measures and need to be more fully integrated into national and sectoral policies, particularly in small island states and developing countries with vulnerable coastal areas. The advancement of national climate adaptation, disaster risk, biodiversity and Blue Economy strategies, and the revision of countries' Nationally Determined Contributions (NDCs) in 2020, are important opportunities to include these ecosystems in official response policies.

There is significant potential to expand EbA in Southern and East Africa. However, if marine and coastal EbA is to be implemented effectively several barriers must be addressed to maximise the opportunities it provides. These include political prioritisation; cross-sectoral integration and effective spatial planning; access to finance; sufficient quantitative data to support private sector engagement; capacity building and peer learning. There is also a need to promote and strengthen partnerships, especially with coastal communities and marginalised groupings such as women and children.

Marine and coastal ecosystem-based adaptation

EbA is often referred to as the 'natural solution to climate change'.[2] This approach recognises that healthy, intact, diverse and well-managed ecosystems provide abundant ecosystem services. These not only offer climate change protection and buffer sensitive coastlines against sea-level rise and storm surge but also enhance socio-economic

1 Scarano F, 'Ecosystem-based adaptation to climate change: Concept, scalability and a role for conservation science', *Perspectives in Ecology and Conservation*, 15, 2017, pp. 65–73.

2 DEA (Department of Environmental Affairs) & SANBI (South African National Biodiversity Institute), *Ecosystem-based Adaptation (EbA) Guidelines*. Pretoria: DEA, 2018.

development goals through their provisioning, supporting, regulating and cultural services. Examples of such services are habitats and reproductive grounds for fisheries, water filtration, erosion prevention, carbon sequestration and spiritual connection. These services are essential to support the livelihoods and incomes of coastal populations, which are increasingly vulnerable to climate impacts. In order to ensure the health and integrity of coastal ecosystems, their protection, sustainable management and restoration are essential.

Drawing on the linkages between ecosystem services, climate change and biodiversity, EbA seeks to address climate adaptation, human well-being benefits, and biodiversity conservation simultaneously. The intersection of these three spheres is what distinguishes EbA from other approaches.

EbA is a relatively new discipline and more analytical attention is needed to assess its impact, measure and evaluate its advantages and limitations, understand the circumstances under which it thrives, and examine opportunities to scale it up. While some anecdotal evidence corroborates the effectiveness of EbA, more quantitative, cost–benefit analysis is needed on the multitude of social, economic and environmental co-benefits that result from effective EbA implementation.

Although all adaptation efforts take place in very specific contexts, a clearer understanding of country-specific policy and practice interventions will encourage peer learning and highlight common political, policy and institutional conditions that maximise the uptake of EbA. At the local level, evidence can help build capacity and assist people to implement transformational adaptation on the ground. At a national level it may encourage the integration of EbA approaches into the wider policy discourse and help increase funding for EbA programmes and initiatives. Also, shared experiences around access to finance could strengthen EbA implementation to directly benefit marginalised coastal communities.

The need for resilient marine and coastal ecosystems in Africa

The coastlines of Southern and East Africa are characterised by the confluence of inland and coastal pressures such as high population densities, poor resource extraction techniques and rapid economic development in or near pristine and vulnerable areas, thereby further degrading natural coastal infrastructure. Added to these threats are climatic pressures, which have emerged as significant and real risks to the integrity and productivity of these coastal ecosystems.[3] Given that many of the ecosystem services that coastal communities rely on also help them to adapt to climate change, it is important to promote resilient coastal ecosystems to reduce climate stresses, especially in countries with high biodiversity and ample vegetation options.[4] An important element in enhancing natural

3 UN Environment, 'Making EbA an effective part of balanced adaptation strategies: Introducing the UN Environment EbA briefing notes', 2018, https://wedocs.unep.org/bitstream/handle/20.500.11822/28174/EBA1.pdf?sequence=1&isAllowed=y, accessed 5 August 2019.

4 *Ibid.*

resilience to climate change is reducing non-climatic stressors that may compound the effects of climate change.[5] Coastal cities such as Beira in Mozambique (home to almost half a million people living in relative poverty) are ill equipped to deal with storms such as Cyclone Idai, which devastated more than 90% of the city in March 2019.[6] With climate forecasts predicting more extreme climatic events, it is imperative that countries in the region prepare and implement national climate adaptation strategies that most effectively build and sustain their social, economic and environmental resilience and emergency response capacity. This includes the increased role of nature, its restoration, sustainable management and protection.

The application of EbA in practice

EbA is defined, referenced and applied differently in diverse country contexts. It can include a range of policy and governance-focused approaches (eg, EbA strategies, policy and planning instruments and related legislative tools), on-the-ground actions and projects, and area-based policy management frameworks (marine protected areas [MPAs], marine spatial planning frameworks and coastal retreat or setback lines). EbA strategies work best when combined with tools to identify sustainable, context-specific coastal livelihood strategies that generate income and promote sustainable fisheries management.

There is a spectrum of practical EbA options available, informed by a country's coastal environment and the availability of natural infrastructure, its degree of physical exposure, economic and political preferences, and its financial positioning. These options include the use of infrastructure and hard engineering solutions (hard adaption), ecosystem or nature-based solutions (soft adaptation), or a combination of the two approaches (hybrid adaptation) that seeks to capitalise on the characteristics of both 'hard' and 'soft', combining structural engineering with natural features.

There are positive and negative trade-offs with varying adaptation choices. For example, man-made infrastructure for shoreline preservation, such as sea walls, breakwaters and dikes, can be counterproductive, often furthering erosion and changing wave energy regimes and sedimentation.[7] Moreover, both the construction and regular maintenance of hard engineering solutions are expensive. However, in the case of extreme weather events, structural barriers are often the most effective at withstanding severe physical impacts. In addition, sea walls can be constructed in conjunction with pockets of green space. This is

5 DEA & SANBI, *Guidelines for Ecosystem-based Adaptation (EbA) in South Africa*, 2017, https://www.sanbi.org/wp-content/uploads/2018/09/SA-Ecosystem-based-Adaptation-EbA-Guidelines.pdf, accessed 30 July 2019.

6 Owoseje T, 'Cyclone Idai destroys 90% of city in Mozambique in "disaster of great proportions"', *Independent Online*, 19 March 2019, https://www.independent.co.uk/news/world/africa/mozambique-cyclone-tropical-idai-beira-zimbabwe-malawi-a8829356.html, accessed 30 July 2019.

7 Climate ADAPT, 'Groynes, breakwaters and artificial reefs', 7 May 2015, https://climate-adapt.eea.europa.eu/metadata/adaptation-options/groynes-breakwaters-and-artificial-reefs, accessed 30 July 2019.

the case with Dar es Salaam's 2 400m concrete seawall project, which includes 1 000ha of planted mangroves and 2 000m² of restored coral reef.

'Soft' EbA, on the other hand, offers an opportunity to invest in 'green protection', which dissipates wave energy and provides shoreline protection through managing or preserving natural solutions. A square kilometre of reef can protect as much as 2 000m² of coastal area, while the costs of ensuring reef health through management are far lower than constructing and maintaining an equivalent man-made defence.[8] There are also many positive ecosystem co-benefits to such an approach. EbA can also include projects that are 'managed' ecosystem solutions, such as coastal dune management and replenished or re-nourished beaches.

On the other hand, many successful nature-based projects are implemented in conjunction with hard infrastructure solutions. These hybrid approaches, such as offshore living breakwater structures and artificial reefs, form a physical barrier between the sea and land and are deliberately constructed to provide or mimic a habitat for species or to aid the restoration of coastal reef ecosystems.

Global and national EbA policy development

The interconnectedness of ecosystem health, climate change and sustainable development is increasingly highlighted in global policy meetings and international sustainability frameworks, for example, in the 2015 UN Sustainable Development Agenda 2030 and its associated Sustainable Development Goal 14 'Life below water'. The objectives of EbA are also echoed in the Sendai Framework for Disaster Risk Reduction 2015–2030, the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011–2020, the Ramsar Convention on Wetlands, and the UN Convention to Combat Desertification. EbA is also central to development approaches taken by other organisations, including the World Bank and the International Union for Conservation of Nature.

Similarly, ecosystems (mainly terrestrial) are mentioned in the text of the Paris Agreement to the UN Framework Convention on Climate Change (UNFCCC), and explicit mention of nature-based adaptation is made in some (but not all) of the NDCs.[9] However, levels of integration and awareness of marine and coastal EbA differ substantially among countries. Of the NDCs submitted to the UNFCCC to date, few refer explicitly to marine and coastal EbA. Although many do refer to ecosystem-orientated visions for adaptation, these have rarely translated into robust targets that involve local communities. While a few African countries described current marine and coastal EbA activities, the majority list it only as an

8 IUCN, 'Coastal Ecosystem-based Adaptation', Briefing Paper, https://cmsdata.iucn.org/downloads/coastal_eba___briefing_paper_4p_final__2_.pdf, accessed 30 July 2019.

9 Countries submit revised NDCs every five years, with a review process that is intended to continually raise ambitions. Countries are currently preparing and updating their NDCs for submission in 2020.

intended/future priority. For example, Madagascar's NDC aims to restore 35 000ha of primary mangrove forests by 2020.[10]

Besides the NDCs, there are other national policy platforms for the inclusion of EbA, such as national adaptation plans and national adaptation programmes of action, the national biodiversity strategies and action plans of the Convention for Biological Diversity, Blue Economy strategies, and associated sectoral policies. However, every country has a different level of climate change adaptation awareness and integration, and countries vary in their levels of EbA integration and adoption. This has translated into various commitments at the regional, national, provincial and local levels.

National-level institutional governance, policy and regulatory landscape

The ultimate success of EbA is likely to hinge on the broader institutional, governance and policy context in which these initiatives are proposed and operate. This is true both at the local level – where capable local institutions are needed to make decisions, roll out projects and ensure the active participation of multiple stakeholders – and at the higher level, as these institutions guide policy development, uptake and political buy-in.

In order to understand the effectiveness of EbA it is important to assess the key national institutional arrangements governing marine and coastal EbA, as well as climate change adaptation. Because of the cross-sectoral nature of EbA, a multitude of institutions are relevant, and need to ensure a degree of coordination. However, in practice, in countries such as Mozambique and Tanzania ministries and departments at the national and local level that are responsible for climate change and ecosystem management often have competing mandates and jurisdictional overlaps. This is particularly the case with coastal ecosystems located between the land and the sea, such as mangroves and seagrass, or within protected areas.

A key challenge for EbA initiatives, many of which are localised projects or programme-based activities, is securing impact at wider scales. Even those initiatives that do work closely with governments often lack the multi-sectoral engagement at higher levels needed to maximise impact. Extending beyond the project scale requires embedding activities in an enabling institutional and policy framework that allows them to be replicated in different contexts, across multiple scales. This has meant embedding EbA in a broader institutional and policy framework that supports the protection of the environment and the devolution of rights to communities. Systematically mainstreaming local EbA

10 UN, NDC Registry, 'Madagascar's Intended Nationally Determined Contribution', 21 September 2016, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Madagascar%20First/Madagascar%20INDC.pdf, accessed 30 July 2019.

approaches into local, national and regional government planning processes and policies is a good way to achieve impact at scale.

Creating an EbA community to share lessons and best practice

Although a number of EbA case studies have been documented globally, an updated database mapping all activities being undertaken is needed, with a view to providing technical leadership and lesson sharing on best practice. For example, in Puerto Rico's coral aquaculture and reef rehabilitation project[11] specific species of coral were selected for the experimental phase of the project because of their high-temperature resilience and recovery capacity.[12] Of the two, the Staghorn coral out-planting project proved to be more successful in replenishing depleted stocks and enhancing reef fish communities. Owing to the location of the Elkhorn farming project, its success was severely compromised by nutrient-loaded and sewage-polluted run-off from the mainland, reminding project developers to consider system-wide spatial dynamics. These project experiences can provide key technical lessons, especially for funding and regulatory agencies hoping to replicate projects elsewhere.

Also, reliable and up-to-date data on the extent, spatial distribution and health of marine and coastal ecosystems is critical for effective planning and management. While there are government research institutes that provide excellent scientific information to policymakers, many lack the capacity and funding to produce thorough data sets on all ecosystems. Independent non-governmental organisations (NGOs) and research institutes play an important role in strengthening the policy-to-science interface.

In order to convince African policymakers of EbA's worth, quantifying ecosystem services in term of job opportunities is worthwhile. For example, coral reef restoration is job-intensive, involving the rearing of coral fragments in nurseries, the transplantation of these fragments to degraded reef areas, and subsequent management and monitoring to facilitate restoration.[13] Emphasis could be placed on opportunities to scale up and replicate these projects, furthering the involvement of local fishers and nearby communities. Countries can also share lessons about their propagation techniques and experiences. Lessons can be learnt from South Africa's Expanded Public Works Programmes, 'Working for Wetlands' and 'Working for the Coast', which employ local unskilled labour to remove invasive alien vegetation, rehabilitate wetlands, and manage and collect waste. This model is replicable in the region, where, for example, a lot of crown-of-thorns starfish must be removed from coral reefs.

11 Sociedad Ambiente Marino, *Expansion of the Puerto Rico Low-Tech Coral Aquaculture and Coral Reef Rehabilitation Project*, Final Report. San Juan: The Nature Conservancy, 2013.

12 *Ibid*., p. 19.

13 Chevallier R, 'Promoting Marine and Coastal Ecosystem-based Adaptation', SAIIA Policy Insights, 56, 2018, https://saiia.org.za/research/promoting-marine-and-coastal-ecosystem-based-adaptation/, accessed 30 July 2019.

While all EbA efforts take place in a specific context, case studies can highlight common political, policy and institutional conditions that maximise their uptake. In this regard, Kenya's mangrove project, Mikoko Pamoja, is a useful model for countries in the region. Lessons include the close relationship that has been built between the project developers, the government and the community; the latter's engagement in the design process; and a long history of community participation in and support for mangrove research and restoration in Gazi village. In addition, a strong partnership with the Kenya Marine and Fisheries Research Institute helps to support the complex and rigorous requirements needed to determine carbon stocks and baselines.

Financing for marine and coastal EbA

Current levels of public and private adaptation finance fall well below the volumes required. Getting the amount of finance needed means drawing lessons from innovative marine and coastal EbA projects that have been financially supported by national budgeting processes; public–private partnerships; payments for ecosystem services (PES) schemes; and other innovative approaches such as environmental impact bonds and corporate social responsibility portfolios.

In the case of PES blue carbon projects, the increasing political momentum to cut greenhouse gas emissions globally has led to the creation of voluntary carbon markets where carbon credits can be traded. This transfer of funds is a promising source of revenue for 'blue forest' conservation projects such as mangroves, tidal marshes and seagrasses. Active projects include Mikoko Pamoja in southern Kenya and Sofala Community Carbon in central Mozambique.

Blue bonds and environmental impact investing are examples of other innovative financing schemes. In 2017 Seychelles launched an innovative investment strategy to finance its Blue Economy. The 'debt-for-nature' scheme is the first of its kind and aims to establish a replicable and scalable model to support the creation and management of an MPA of 400 000km^2. This is the first time the Paris Club creditors have supported a debt agreement designed to benefit climate adaptation, and the first time a developing country creditor – South Africa – has made a debt deal with another developing country. The combination of public and private funds, each leveraging the other, creates a new model for co-investment debt swaps.

The private sector is likely to be mobilised if there is enough information to make a case for marine and coastal EbA.[14] Reliable quantitative estimates are needed to assess the capability of ecosystems to reduce storm surge and sea level-rise impacts, and to provide reliable cost–benefit analysis of how they compare with other measures based on traditional engineering approaches. Where, for example, coastal wetlands have proven to

14 Chevallier R, *op. cit.*

be more cost effective than sea walls and levees (by requiring less maintenance and being able to keep pace with sea-level rise), this needs to be clearly modelled and presented as a business case.[15] In addition, research that illustrates the costs of 'business-as-usual' is imperative. For example, it is predicted that annual damages from flooding will double and costs from frequent storms will triple without the presence of functioning coral reefs.[16]

The public sector plays a key role in encouraging the private sector to participate in the implementation of EbA actions by providing incentives and economic signals.

Partnerships to support the uptake of EbA in policy and practice

EbA requires cross-sectoral collaboration through partnerships with a clear focus on implementing interventions. This requires coordination at several levels to align resources and programmes of work among partners.[17] Central to this is the participation of impacted communities and of civil society. Communities have many opportunities to participate in EbA projects: through monitoring, data collection, surveillance, planting and rehabilitation, and by acting as the key enablers of project implementation. While it remains a challenge for women to access decision-making positions, there are many new gender-based organisations, such as GEM-Plus in Seychelles and the Tanzanian Women Fish Workers Association. These show that social and gendered norms and behaviours can be changed. Given that women bear the brunt of climate change impacts, their role in EbA implementation is crucial in both empowering the community and enhancing its resilience to such impacts.

In order to maintain healthy coastal ecosystems, local governance institutions must be strengthened to increase the benefits they derive from the sustainable use of marine resources, and policy and legislation is still needed to support more broad-based community management. While community-based natural resource management is widely recognised as an important principle, countries differ considerably in terms of their levels of inclusiveness in its application. Much can be learned about marine co-management through the models being rolled out by international social enterprise Blue Ventures in Madagascar and Zanzibari NGO Mwambao Coastal Community Network.

Conclusion

Despite the commitments made under the landmark Paris Agreement in 2015, the world will continue to experience negative climate impacts. Pre-emptive adaptation planning is necessary to build and sustain countries' social, economic and environmental resilience.

15 *Ibid.*

16 Beck M *et al.*, 'The global flood protection savings provided by coral reefs', *Nature Communications*, 9, 2018, p. 1.

17 DEA & SANBI, *Strategic Framework and Overarching Implementation Plan for Ecosystem-Based Adaptation (EbA) in South Africa: 2016–2021*. Pretoria: DEA, 2016.

While the importance of marine and coastal ecosystems is increasingly recognised, EbA has still not developed the sufficient political traction needed, and is yet to be fully integrated across all sectors of government. While some countries have national policy frameworks that include ecosystems, many still have a way to go to incorporate and mainstream marine and coastal ecosystems in climate response strategies. This includes the incorporation of coastal ecosystems into the next iteration of NDCs, as well as into new or revised oceans strategies, national development frameworks and fisheries policies. They also need to be embraced by development and humanitarian organisations, the private sector and multilateral financing institutions.

Despite several demonstrable cases internationally, only a few large-scale EbA projects are operational in Southern and East Africa, and those that do exist are small in nature and often financially unsustainable. Many governments still revert to non-ecosystem-based engineered solutions to address the destructive impacts of sea-level rise and storm surge. One reason for this is the dearth of successful EbA projects operating at scale, as well as the lack of transferable and user-friendly concepts, methodologies and instruments for mainstreaming, adapting and integrating EbA.

It is thus imperative that softer, nature-based responses are promoted (as standalones or in combination with hard engineering) as a central element of coastal protection. For this to be achieved, the gaps, barriers and enablers relating to the uptake and roll-out of EbA policy and implementation need to be addressed. These include coordination and policy mainstreaming, research and inadequate spatial data, capacity constraints, skills shortages, lack of political buy-in and a weak policy environment. It is also important to consider national circumstances and budgetary constraints. In particular, the lack of thorough and systematic documentation on long-term functioning and effectiveness, as well as long-term cost–benefit analyses, has created reluctance and uncertainty within the business sector. Additionally, there are significant challenges in scaling up EbA and incorporating it into subregional, national and local climate policies and strategies.

Here, a wide variety of national and international stakeholders can help governments to achieve their objectives. The key to success is the inclusion and participation of communities through co-management models. With increased financial and human resources, knowledge and information, ownership, and stakeholder engagement and partnerships, there are opportunities to improve the level of mainstreaming and implementation of EbA. This will in turn increase the resilience of coastal communities.

About this Policy Briefing

This policy briefing has been extracted from a longer SAIIA synthesis report titled 'Marine and Coastal Ecosystem-based Adaptation for Enhanced Resilience in Southern Africa'. The research project was initiated in April 2018 and ran until the end of August 2019. The broader research project focuses on marine and coastal EbA in Mozambique, Seychelles, South Africa and Tanzania, drawing on international and country-based examples of where and how EbA can be strengthened to improve climate resilience and adaptation.

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Low income communities in Tanzania are highly dependent on mangrove harvesting for their livelihood, Rufiji Delta, Tanzania (Romy Chevallier)

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