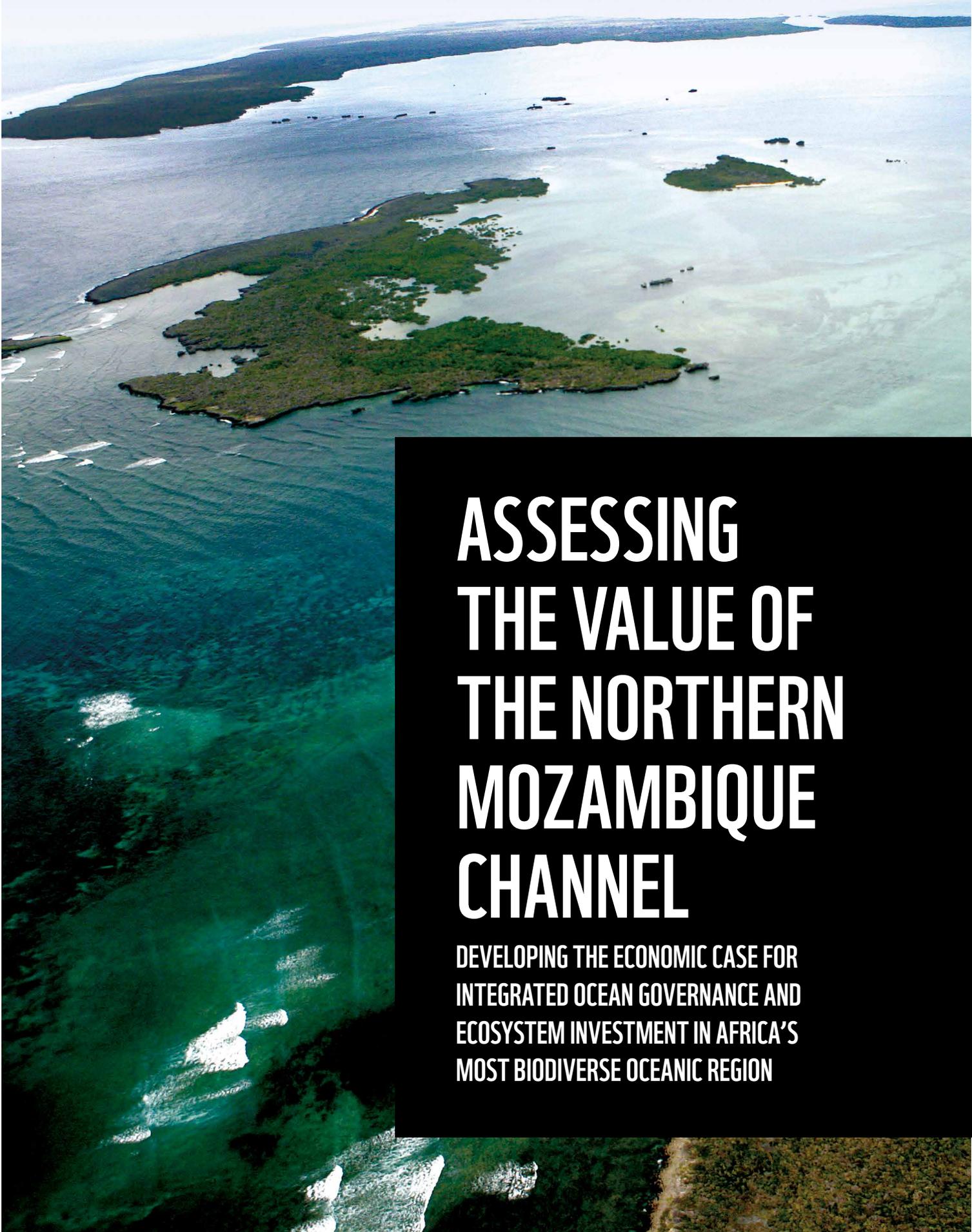




Restoring the  
Northern Mozambique  
Channel Region



# ASSESSING THE VALUE OF THE NORTHERN MOZAMBIQUE CHANNEL

DEVELOPING THE ECONOMIC CASE FOR  
INTEGRATED OCEAN GOVERNANCE AND  
ECOSYSTEM INVESTMENT IN AFRICA'S  
MOST BIODIVERSE OCEANIC REGION

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# ABOUT THIS REPORT

The Northern Mozambique Channel is recognized as Africa's most biodiverse oceanic region, supporting millions of people with food, livelihoods and protection against climate impacts.

Its ecosystems are critical not only to local communities, but also to national and regional economies. Yet these benefits are often overlooked or undervalued, especially in economic decision-making, which leaves them vulnerable to degradation from unsustainable development practices.

This report, *Assessing the Value of the Northern Mozambique Channel*, makes the case for conserving and investing in the Northern Mozambique Channel's (NMC's) natural capital as a foundation for sustainable development by assessing the region's total natural capital and quantifying the value that ecosystem services contribute to the region and its economies on a yearly basis. It establishes integrated ocean governance as a necessary approach to sustainably managing marine resources given the recent uptick in industrial activities in the region, and identifies practical pathways and investments to safeguard

the region's natural capital while unlocking the opportunities of its sustainable blue economy.

This report aligns with the shared Vision and Roadmap for marine spatial planning and sustainable use of the NMC that were developed by NMC country representatives and stakeholders through a series of workshops hosted by WWF, the Nairobi Convention Secretariat and partners in 2024 and 2025. NMC country representatives also contributed to the verification of data in this report and the design of its scenario modelling analysis.

This report was produced through a partnership between WWF and the Nairobi Convention Secretariat under the Integrated Management of the Marine and Coastal Resources of the Northern Mozambique Channel (NoCaMo) Project, with research led by Prime Africa Institute.



# KEY MESSAGES

**The Northern Mozambique Channel (NMC) is the most biodiverse oceanic region in Africa** and the second-most biodiverse oceanic region in the world.



**The NMC's natural capital is valued at US\$277 billion.** This value cannot be replicated, traded or easily restored once it has degraded beyond threshold limits.



**About 10.7 million people live within 10 kilometres of the coastline,** deriving various benefits from the region's marine and coastal ecosystems.



**This natural capital delivers benefits valued at US\$5.7 billion to the region each year. However, only US\$615 million of this value is currently captured in formal regional gross domestic product (GDP) figures.** This means that US\$5.1 billion of ecosystem services benefits to the region are externalized – and therefore not considered in governance decisions – each year.



**About 61% of the benefits of ecosystem services, valued at about US\$3.2 billion, are conferred directly to NMC residents each year.** These benefits take the form of food, building materials, cultural services, and protection against natural hazards such as climate change-related flooding and storm surges. The remaining benefits are conferred to visitors to the region, including foreign investors and tourists.



**Adding currently externalized ecosystem services would raise the region's GDP to US\$16.3 billion per year.** The region's formal annual GDP – which excludes most of the benefits delivered by ecosystem services – currently totals US\$11.3 billion per year.

**However, these benefits will only be obtainable if the region engages in robust, inclusive integrated ocean governance that successfully balances competing priorities** to safeguard the region's natural capital, both today and in the future.



**To successfully implement the NMC Roadmap will require further investment**

to coordinate efforts to reverse ecosystem degradation, protect ecologically vulnerable areas and seize unexplored opportunities in the region's sustainable blue economy.

Identified investment opportunities include community-based mariculture, ecotourism, fisheries cold chains, establishing woodlots and agroforestry as alternatives to mangrove wood, household energy solutions, carbon and biodiversity markets, and insurance-related services.



**Modelling indicates that investing only US\$457 million to establish the NMC Blue Hub and support a limited number of Roadmap activities (ecotourism, rehabilitating mangroves, establishing woodlots and developing fisheries cold chains) would yield ecosystem services benefits valued at nearly US\$8.9 billion.**

The resulting benefit-cost ratio of about 18:1 substantially exceeds the returns observed on traditional built infrastructure investments, which typically have a benefit-cost ratio of between 2:1 and 6:1.



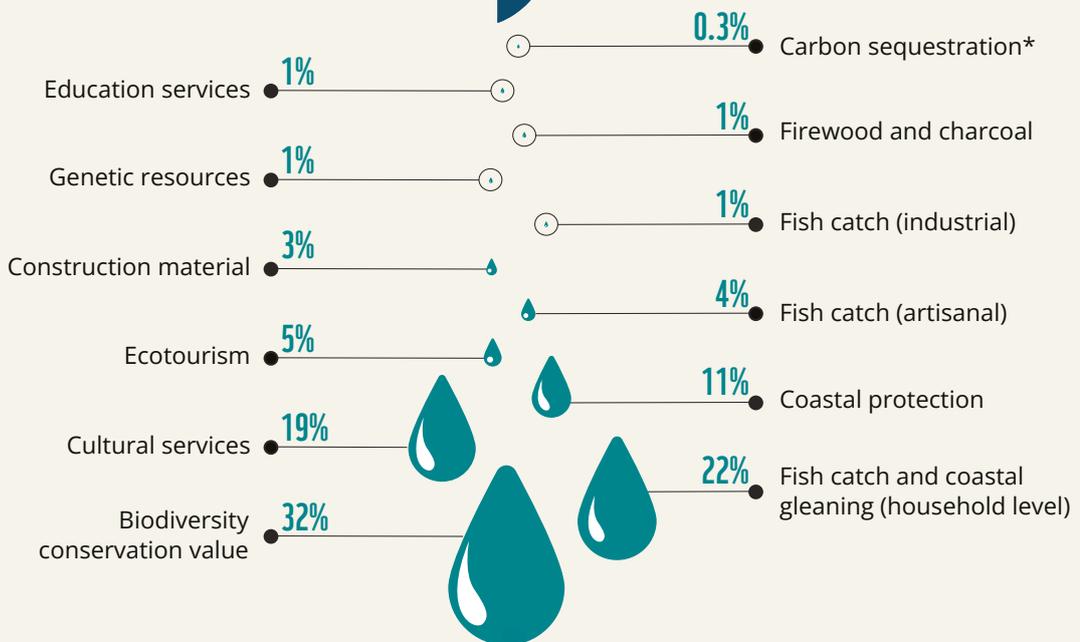
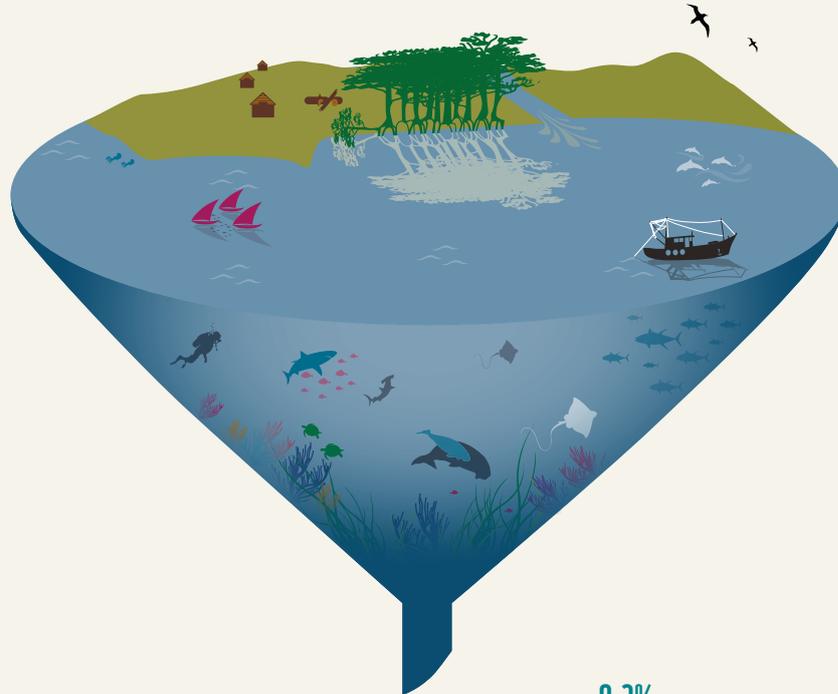
**Substantial progress has been made towards such integrated ocean governance.** Specifically, a Vision and Roadmap, together with Technical Guidelines for pursuing the Roadmap through marine spatial planning, have been collaboratively developed for the region.

**A central secretariat, the NMC Blue Hub, is proposed to coordinate these investments.** The role of the NMC Blue Hub would be to support integrated ocean governance by, among other responsibilities, driving marine spatial planning processes; advocating for legal frameworks that enable sustainable blue economy investments; sharing conservation capacity with in-country focal points; facilitating knowledge- and data-sharing; and harmonizing investments into shared natural capital.

**Co-benefits of such investment include accelerated growth of GDP with the creation of 100 000 additional jobs.** The informal economy, which is currently not included in GDP figures, would contribute an additional US\$213 million to regional GDP.

# 1. THE NATURAL VALUE OF THE NORTHERN MOZAMBIQUE CHANNEL

The Northern Mozambique Channel's natural capital is valued at **US\$277 billion**

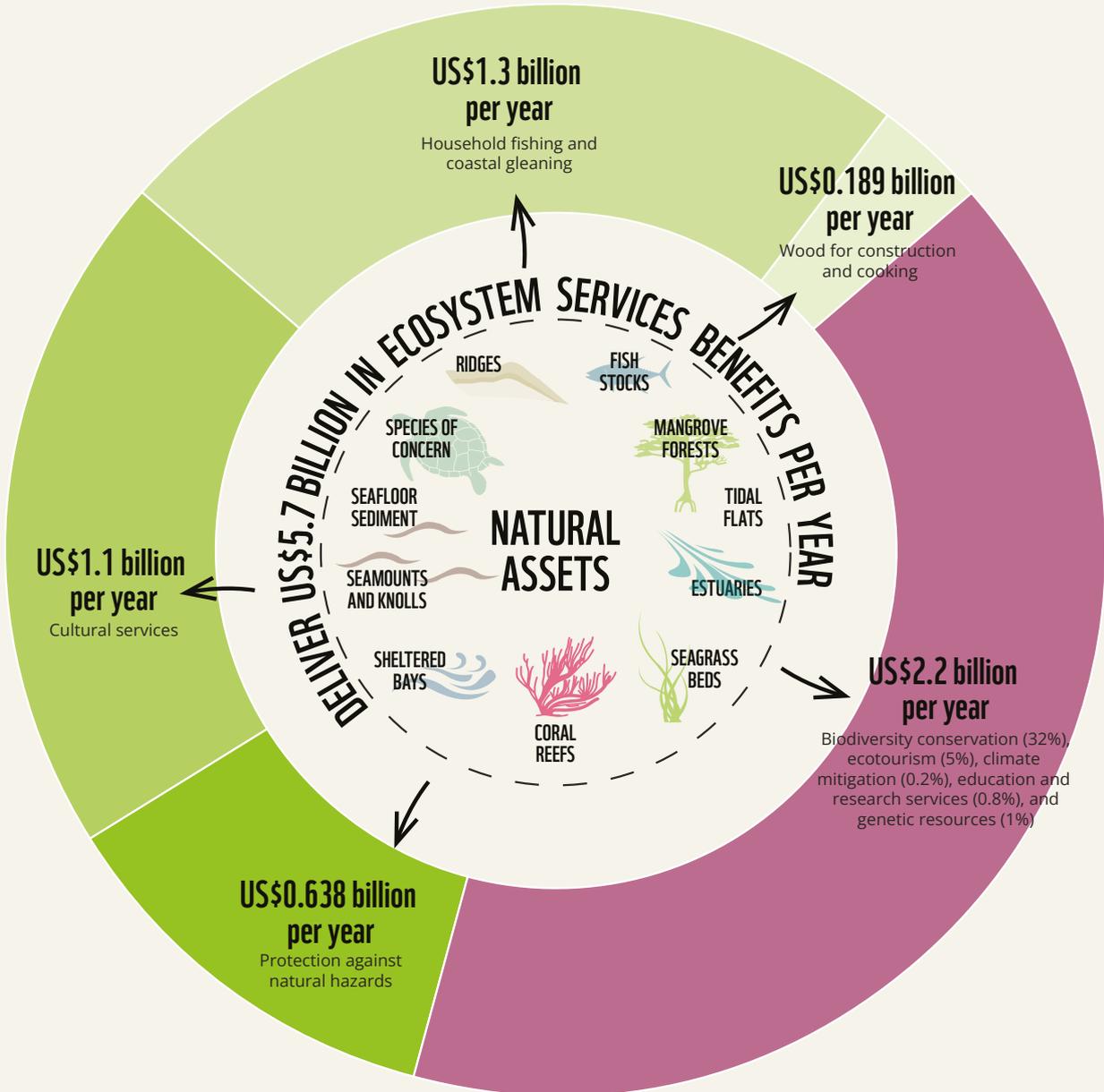


This natural capital delivers benefits valued at **US\$5.7 billion per year**

\* The carbon sequestration figure is based on the existing extent of mangroves. This figure could increase substantially if conservation efforts effectively expand the footprint of mangroves across the region.

**2. THE BENEFITS AND BENEFICIARIES OF THE NMC'S ECOSYSTEM SERVICE**

**61%** of ecosystem service benefits are conferred to **coastal communities**.



The remaining **39%** of benefits are conferred to **visitors to the region**.

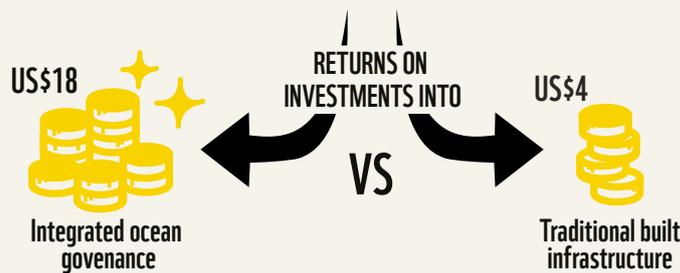
# KEY MESSAGES

## 3. THE PROMISE OF INVESTING IN NATURE

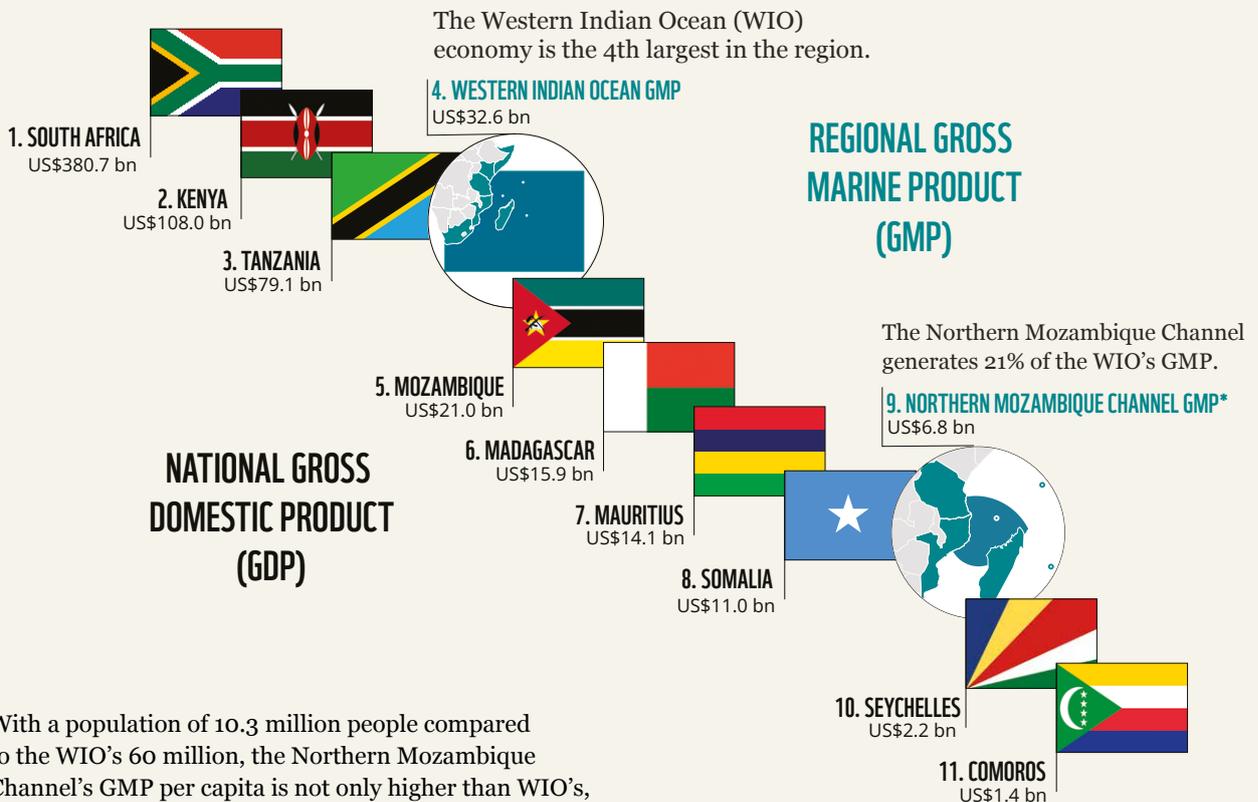
Every **US\$1** invested into restoring and securing ecosystems services in the region will yield **US\$18** in ecosystem services benefits.



This is substantially more than typical return rates of **US\$2 to US\$6** for traditional infrastructure investments.

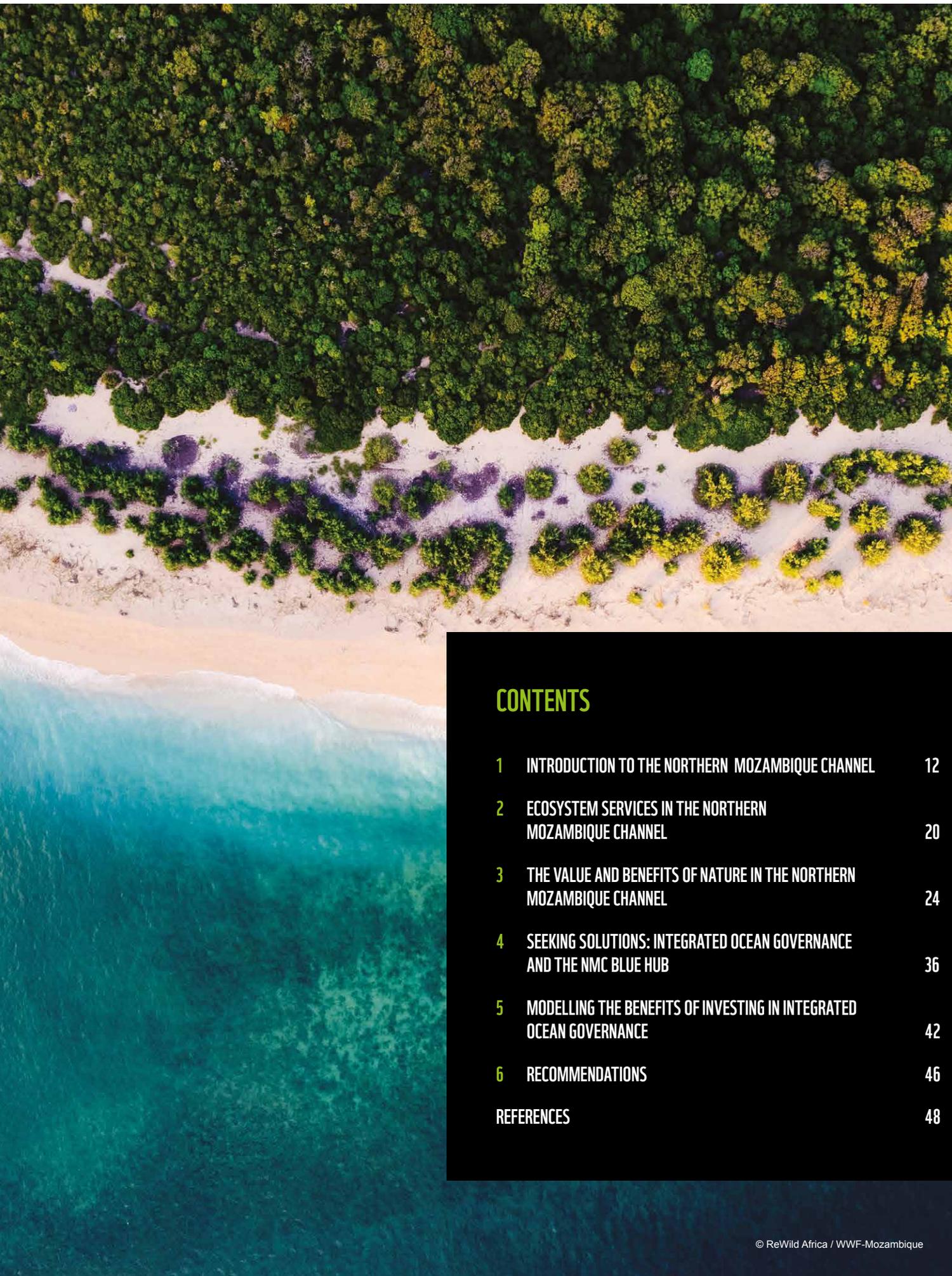


## 4. THE NMC AS A KEY CONTRIBUTOR TO THE WESTERN INDIAN OCEAN ECONOMY



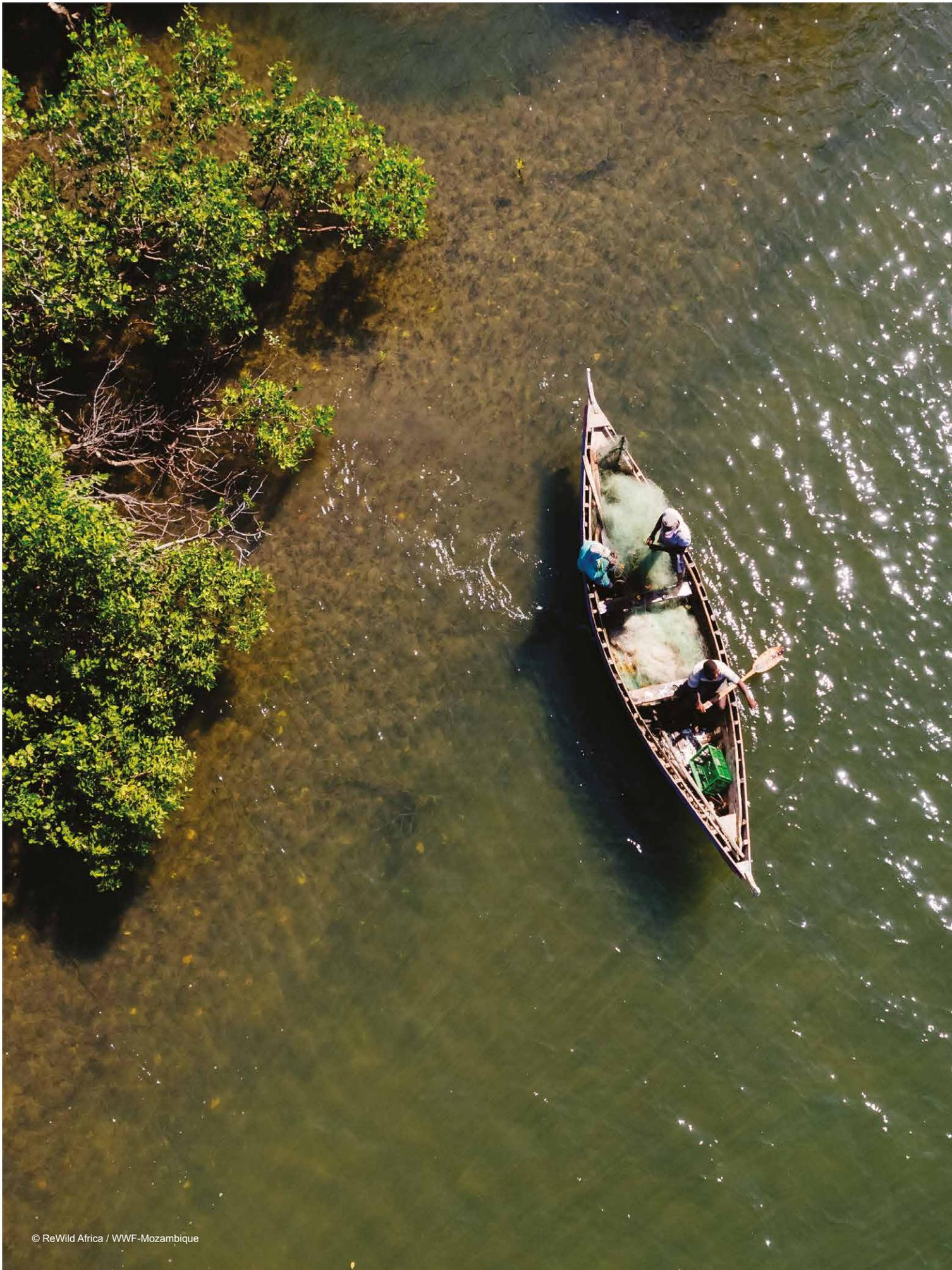
With a population of 10.3 million people compared to the WIO's 60 million, the Northern Mozambique Channel's GMP per capita is not only higher than WIO's, but also outranks GDP per capita of Mozambique, Somalia and Madagascar.

\*Adjusted for ecosystems services benefits values.



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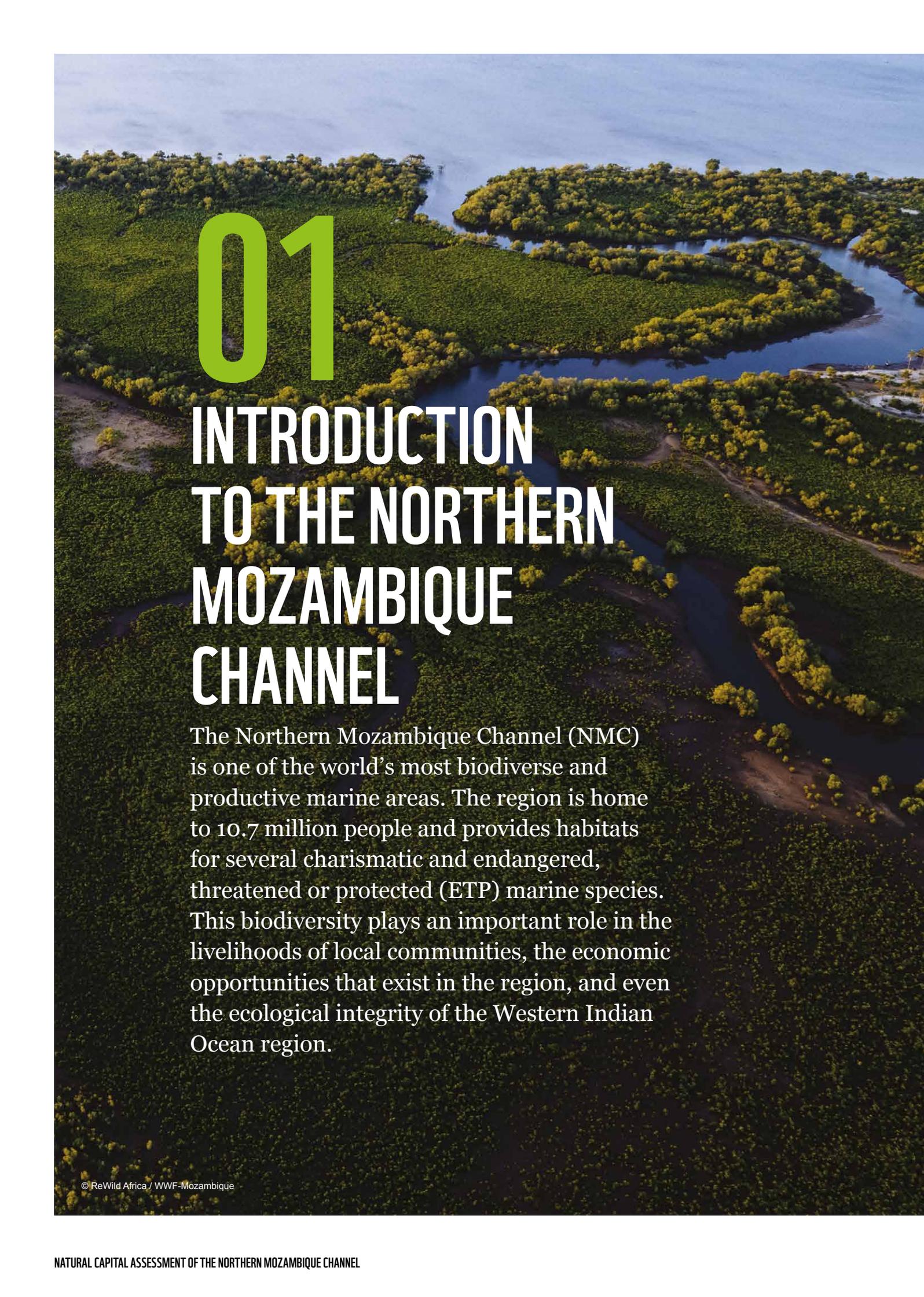
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# ABBREVIATIONS

CERA	Comparative ecological risk assessment
EEZ	Exclusive economic zone
ETP	Endangered, threatened or protected
GDP	Gross domestic product
ha	Hectares
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature and Natural Resources
km	Kilometres
m	Metres
MEA	Millennium Ecosystems Assessment
Mm	Millimetres
MPA	Marine protected area
MSP	Marine spatial planning
NMC	Northern Mozambique Channel
SADC MCSCC	Southern African Development Community Monitoring, Control, & Surveillance Coordination Centre
SDG	Sustainable Development Goal
SEEA	System of Environmental Economic Accounting
SWIO	South West Indian Ocean
UNESCO	United Nations Educational, Scientific and Cultural Organization







# 01

## INTRODUCTION TO THE NORTHERN MOZAMBIQUE CHANNEL

The Northern Mozambique Channel (NMC) is one of the world's most biodiverse and productive marine areas. The region is home to 10.7 million people and provides habitats for several charismatic and endangered, threatened or protected (ETP) marine species. This biodiversity plays an important role in the livelihoods of local communities, the economic opportunities that exist in the region, and even the ecological integrity of the Western Indian Ocean region.

## 1.1 LOCATION

The NMC covers approximately a million square kilometres (km) of the South West Indian Ocean (SWIO) and runs along Africa's mainland from the southern part of Tanzania to just south of Pebane, in northern Mozambique. It also includes the northwestern and northeastern coastlines of Madagascar, as well as the Comoros, the islands of Mayotte, the Glorioso archipelago, and the southernmost section of the Seychelles exclusive economic zone (EEZ). At its narrowest point, the channel is less than 400 km wide (Figure 1.1).

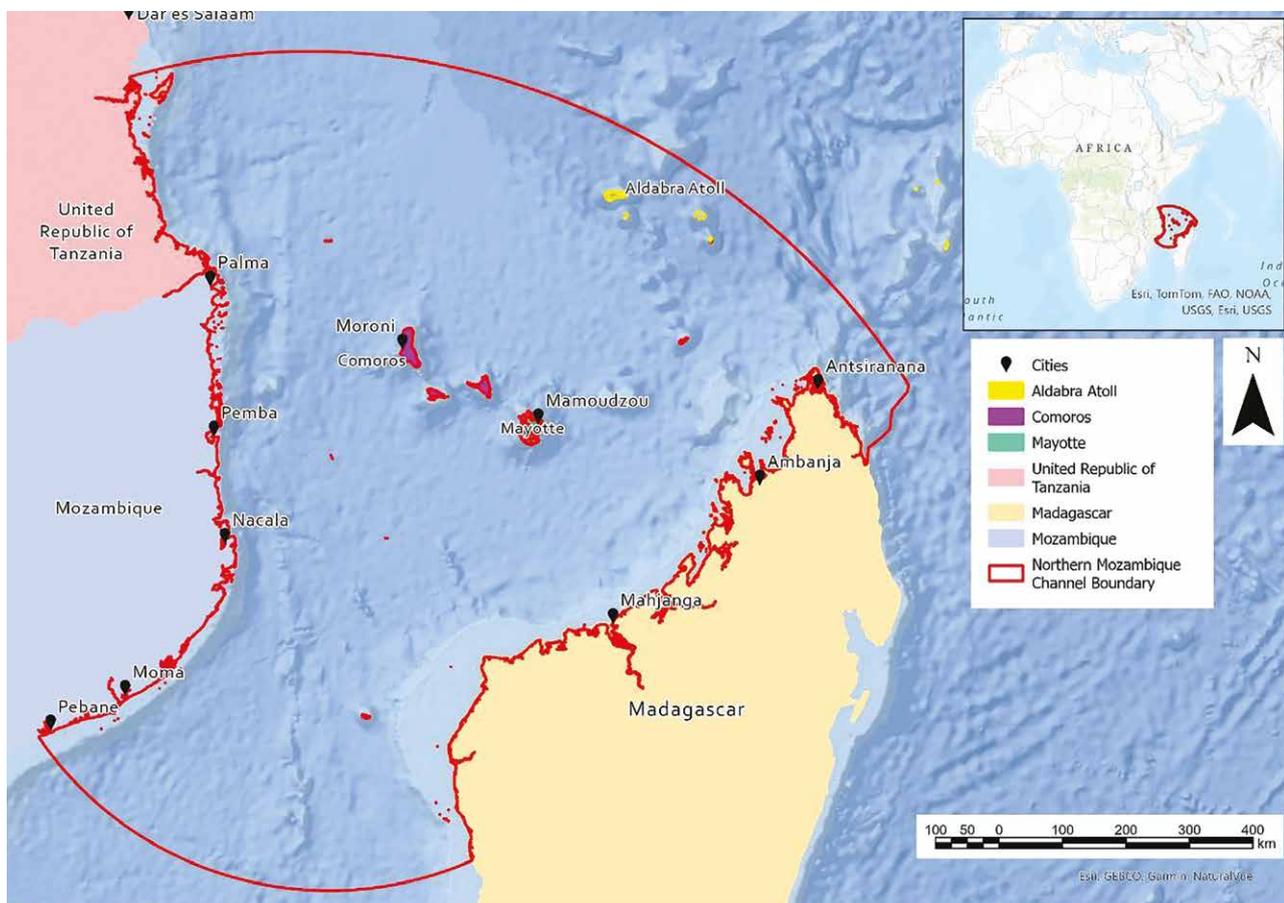
## 1.2 RELEVANCE WITHIN THE BROADER WESTERN INDIAN OCEAN REGION

The NMC is the world's second-most – and Africa's most – biodiverse oceanic region. Its coastal mangroves, estuaries and coral reefs provide spawning grounds for various species of fish (Obura et al., 2018), including tunas and other commercially important species in the Western Indian Ocean. The NMC is also home to several heat-resistant species of coral (Hoegh-Guldberg et al., 2018) that, due to the region's strong interconnectivity, could serve as a source of coral larvae to reseed reefs across the greater Western Indian Ocean region once the climate stabilizes (Gamoyo et al., 2019).

## 1.3 POPULATION

About 10.7 million people live within 10 km of the NMC coastline. These communities depend on the NMC's ecosystem services for food security, cultural fulfilment, socioeconomic prospects and livelihoods (Ghermandi et al., 2019; Albert, 2021). Even though the coastline's population density is currently relatively low in most areas, the population is expected to reach 20 million by 2040 (UN-DESA, 2020), with demand for natural resources increasing in step.

**FIGURE 1.1. THE NORTHERN MOZAMBIQUE CHANNEL STUDY AREA FOR NATURAL CAPITAL ASSESSMENT**



## 1.4 KEY ECONOMIC ACTIVITIES

The NMC supports a range of commercial activities, including fisheries, tourism, and oil and gas exploration. It is also a major maritime transport route. While these activities form the backbone of the region's socioeconomic landscape, they also exert considerable pressures on the NMC's natural ecosystems.

### 1.4.1 ARTISANAL AND COMMERCIAL FISHERIES

Artisanal fisheries account for most landings in the NMC and are the primary income-generating activity for a large number of coastal communities (Samoilys et al., 2015). However, fisheries contribute only a small amount to the formal gross domestic product (GDP) of countries in the region: 2.7% for Tanzania, 5.5% for Madagascar, 4% for Mozambique, 15% for Comoros, and 30% for Seychelles (Lallemand, 2019).

#### TUNA FISHERIES

The NMC region is a major fishing ground for skipjack, yellowfin, and bigeye tuna (Chassot et al., 2019; Kaplan et al., 2014). However, tuna fish stocks in the Indian Ocean have long been overfished beyond sustainable levels (Tidd et al., 2025).

Tuna aggregations are predominantly caught by purse seine fishing with the use of a floating fish aggregating device. The mean annual catch of purse seine tuna over the past three decades has amounted to more than 30 000 tonnes – more than 10% of the total purse seine catch of the entire Indian Ocean (Chassot et al., 2019). The management of the tuna population in the NMC is under the jurisdiction of the Indian Ocean Tuna Commission (IOTC), which is primarily composed of Indian Ocean nation states but also includes representatives from distant water fishing nations.

#### SHRIMP FISHERIES

There are well-developed shrimp fisheries in the NMC, particularly along the west coast of Madagascar (Groeneveld, 2015). The shrimp fisheries in Mozambique are concentrated south of the NMC (Penn & Sousa, 2018), while Tanzanian shrimp fisheries are still in the experimental phase (Mushi, 2025). Shrimp aquaculture is in its infancy in the region but is most significant in Madagascar, where shrimp farming is practiced (Mmochi, 2015).

### 1.4.2 TOURISM

Tourism in the NMC has historically focused on land-based attractions (such as national parks and markets) and beach tourism. In countries with established marine national parks, such as Tanzania, interest in marine tourism is growing, with positive knock-on effects for local income.

The national development plans of Madagascar and Mozambique aim to expand tourism by leveraging key islands near their mainland coasts (Benjamim & Azevedo, 2024; Scales, 2014). Despite these plans, infrastructure limitations – most notably the isolation of key marine destinations from international airports – have hindered growth of marine-based tourism (Kepher et al., 2024). The cruise ship industry in the region is also minimal, with only two vessels traversing the Mozambique Channel in 2017. However, this subsector is steadily growing, with Maputo receiving 14 ships with 16 000 tourists in 2024 (360 Mozambique, 2024; MozParks, 2024).



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### 1.4.3 OIL AND GAS

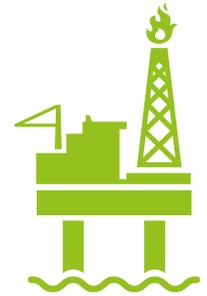
About 59 400 km<sup>2</sup> of the NMC – some 5.8% of its total area – is currently under oil and gas contracts, and nearly the full extent of the rest of the channel has been divided into exploration blocks (WWF, 2025). The overlap between oil and gas exploration and mining blocks with protected areas, wildlife migration corridors, areas demarcated for tourism development, and areas that support fish or prawn breeding and nurseries, is likely to expand (Obura et al., 2018).

Three of the four geological provinces that hold recoverable oil and gas resources border the NMC (Brownfield et al., 2012). The estimated volume of these reserves is 27 632 million barrels of oil, 441 051 billion cubic feet of gas and 13 772 million barrels of natural gas liquid. To extract and process these reserves, some of world's largest liquefied natural gas processing plants have been proposed in Cabo Delgado, Mozambique. At least four operational gas processing plants have already been developed in Tanzania (Obura et al., 2018).

The extraction of minerals from the Mozambique Channel's seabed has to date not received significant investment, and mineral concessions only overlap with 1% of the NMC (WWF, 2018). However, the potential for coastal mining – one of Mozambique's fastest growing industries – is high (Nairobi Convention, 2020).

### 1.4.4 MARITIME TRANSPORT AND TRADE

The Mozambique Channel – and the NMC portion of it – is a vital route for international trade, facilitating the movement of more than half of the region's goods. The expansion of oil and gas activities and terrestrial mineral extraction in the region is expected to drive port development and increase shipping operations (Obura et al., 2018). This growth raises concerns about pollution, habitat destruction, and the need for stricter maritime regulations.



About  
**59 400 km<sup>2</sup>**  
of the NMC  
– 5.8% of its  
total area – is  
currently  
under oil and  
gas contracts  
(WWF, 2025).



# 1.5 PHYSIOGRAPHICAL ELEMENTS AND DOMINANT CURRENTS

The Mozambique Channel formed more than 180 million years ago as an ancient rift separated from the African continent, marked by the Davie Ridge that runs north-south along the seafloor (reaching up to 300 metres [m] below sea level), the Leven Bank and the Glorieuses Islands. While continental shelves are generally quite narrow in the NMC, continental slopes are steep, descending from 50 m to 1 000 m over relatively short distances (Wiles et al., 2017).

Ocean circulation in the region is driven by the South Equatorial Current, which generates a dynamic system of mesoscale eddies – spinning water masses 100 to 300 km in diameter (Ternon et al., 2014) – that can extend to the seafloor (Swart et al., 2010) (Figure 1.2). These eddies play a key role in driving ecological productivity by mixing nutrient-rich deep waters

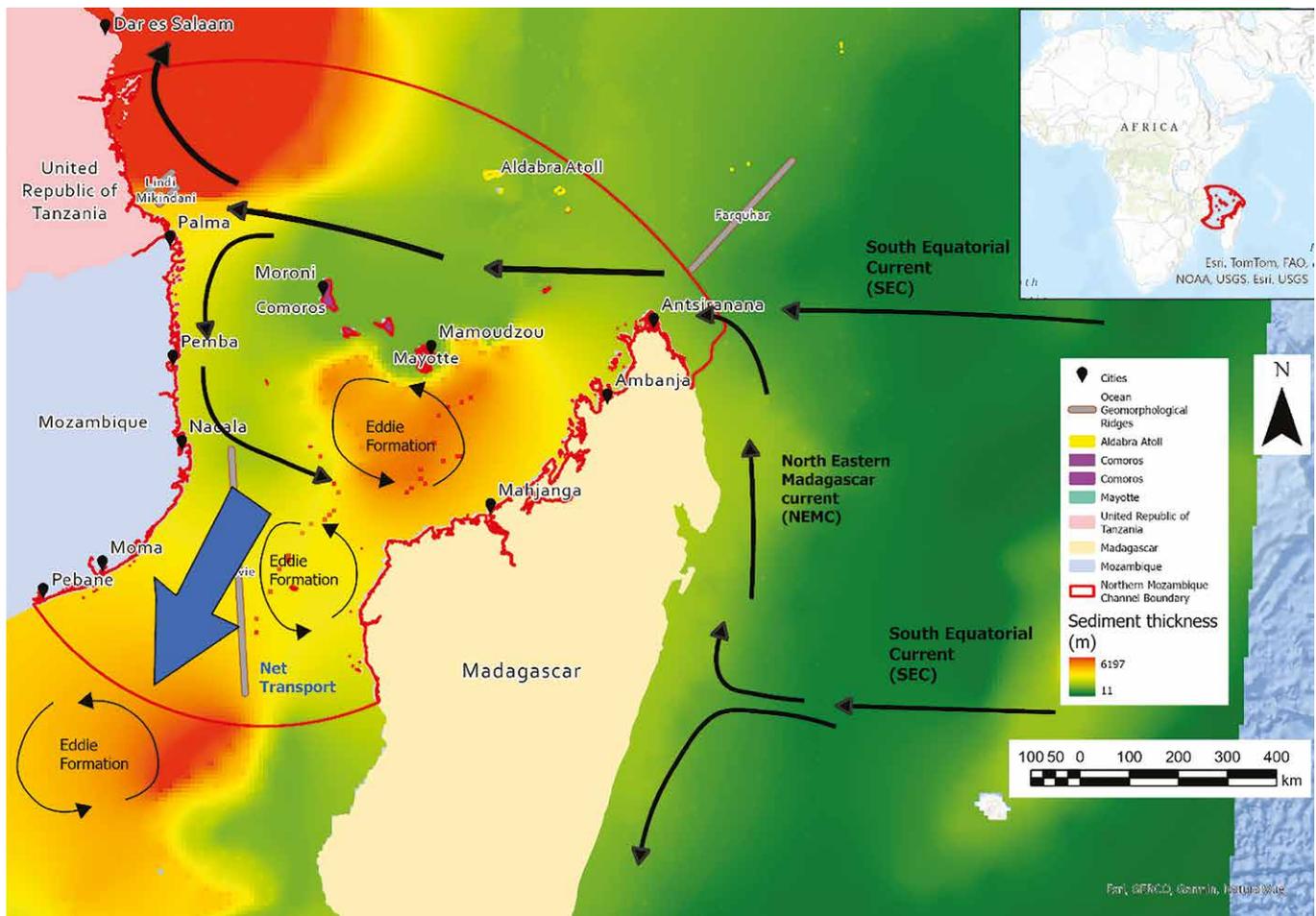
with nutrient-poor surface waters (Crochelet et al., 2020; Gamoyo et al., 2019). When eddies interact with the coast, they draw productive coastal waters into the channel, further supporting marine food webs (Roberts et al., 2014).

At deeper levels, circulation is structured by distinct water masses defined by differences in temperature and salinity. In the northern part of the channel, features such as the Comoros Gyre and seasonal eddies promote vertical mixing between surface and deep waters, particularly during periods of stronger currents and winds.



The Mozambique Channel formed more than **180** million years ago as an ancient rift separated from the African continent.

**FIGURE 1.2. MAJOR SURFACE CURRENTS IN THE NMC**



## 1.6 CONNECTIVITY

The NMC marks a significant intersection of species migration paths and exchanges between habitats. This high connectivity contributes to the region being classified as an ecologically significant area (CBD, 2012). At the same time, oceanographic features such as the Davie Ridge, the diverging ocean currents in the north and the constriction of land in the south are enough to act as a barrier to gene flow for some species, leading to interspecies differentiation and adding to the NMC's value as a source for genetic variation (Lett et al., 2024).

## 1.7 CLIMATE

The NMC falls within the subtropical and tropical climates of the Indian Ocean. Coastal temperatures range from 20°C to 29°C, with sea surface temperatures between 26°C and 30°C (World Bank, 2024a). Rainfall is seasonal – lowest from May/June to September/October, with “long rains” from February/March to May and “short rains” from October to November. Annual rainfall varies widely, from 3 600 millimetres (mm) in southwestern Tanzania to less than 800 mm on Madagascar's west coast (World Bank, 2024b).

The dominant climatic feature is the monsoon, with prevailing winds reversing seasonally: northwesterly winds bring warmer, wetter conditions from December to March, while southeasterly winds bring cooler, drier weather from June to November (Mawren et al., 2023). Cyclone season overlaps with the wet monsoon period, which entails intense rainfall and strong winds. Large-scale climate systems such as the Indian Ocean Dipole and El Niño Southern Oscillation also influence the region and can cause irregular shifts in temperature, rainfall and wind.

Climate change is expected to significantly impact the NMC. Sea surface temperatures are expected to increase by up to 2°C, which will lead

to more frequent and intense marine heatwaves, especially in the NMC (IPCC, 2023; WWF, 2024). Sea levels are projected to rise by 40 centimetres in a <2°C warming scenario and up to 1 m by the end of the century under a 4°C warming scenario (IPCC, 2023), further exacerbating coastal erosion and flooding. The region also faces a heightened chance of damaging winds within the next 10 years (Charrua et al., 2020), alongside heavy precipitation and an increase in the proportion of Category 4 or 5 tropical cyclones (Seneviratne et al., 2021). Mozambique and Madagascar are listed as among the top 10 risk hotspots with high vulnerability to tropical cyclones (Schubert, 2024).

## 1.8 PROTECTED AREAS

The NMC has several national marine protected areas (MPAs), which serve as critical safe havens and spawning grounds for species. MPAs confer protection to natural resources and limit the risk from potential hazards, especially anthropogenic activities and competing interests. Often, penalties are in place for unauthorized interference.

Nearly all of the Seychelles' EEZ in the NMC is protected, contributing to the protection of biodiversity associated with seamounts and island structures

within the country's presence in the NMC. These structures include the Aldabra Atoll (a UNESCO world heritage site). The Comoros' protected areas mainly protect island coastal resources, whereas protected areas around the Mayotte islands extend offshore and include pelagic and deep-sea environments (such as seamounts and knolls). However, both the Mayotte islands and the Comoros have substantial seagrass areas within their protected areas.

By contrast, the protected areas of Mozambique and Madagascar do not cover most of the natural assets along their respective coastlines. Significant distributions of seagrass along the Madagascan coastline are outside protected areas. Although Mozambique has three major stretches of protected area, this does not fully cover the country's natural assets (corals, mangroves and tidal flats), which extend along the length of its coastline within the NMC. Similarly, Madagascar's protected areas are peppered along its coastline in the NMC, including some but not all of distributions of mangrove, tidal flats and coral reef habitats.

The protected areas on Tanzania's southern coast encompass most of the distribution of natural assets on the coastline (including mangroves, tidal flats and coral reefs). Interestingly, Tanzania, Mozambique, and Madagascar do not have far-offshore, open-ocean protected areas, despite the presence of biodiversity hotspots such as seamounts and knolls within their EEZs. However, these countries do have protected areas for natural assets along their continental shelves.

There are no MPAs along the Davie Ridge, likely due to these deep-sea structures being under-researched and under-sampled.



Sea surface temperatures  
are expected to  
increase by up to  
**2°C.**

## 1.9 NATURAL ASSETS

The NMC serves as a biological reservoir for East African coastal areas, boasting natural assets and open-ocean habitats that support biodiversity, ecosystem functioning and key marine species.

### 1.9.1 HABITATS

#### MANGROVE FORESTS

The NMC hosts 399 488 hectares (ha) of mangrove forests, although more recent measurements are needed (Bennett et al., 2024). These habitats buffer coastal communities from floods and storm surges. They also provide important nursery and breeding grounds for marine species and are thus critical for commercial fisheries. Mangroves are valuable reservoirs of carbon and are classified as blue carbon habitats due to their ability to sequester carbon from the atmosphere in their tissues and soils.

#### TIDAL FLATS AND SALT MARSHES

The total area of tidal flats within the NMC system is about 296 872 ha (Murray et al., 2019; Worthington et al., 2024). Tidal flats serve as key feeding and roosting grounds for migratory birds, as well as nurseries for juvenile fish and invertebrates. While salt marsh species occur widely in the region, the overall habitat is poorly described, and insufficient data exists on its distribution. Salt marshes contribute significantly to carbon sequestration, nutrient cycling and shoreline stabilization, while also acting as natural buffers against storm surges and sea-level rise.

#### ESTUARIES AND RIVER SYSTEMS

The high biological productivity of estuaries has made them the focal points for human settlements, especially for small-scale fisheries (Groeneveld, 2021). Rivers act as transportation highways, provide fishery resources, support water provisioning and have cultural significance. There are several rivers

and streams that feed into the NMC, particularly from Mozambique, Tanzania and Madagascar. Based on remote sensing geospatial analysis, it is estimated that there are about 300 estuaries in the NMC.

#### SEAGRASS BEDS

Up to 12 species are found in the NMC's 583 552 ha of seagrass beds (Palacios et al., 2021, UNEP & Short, 2021; Bennett et al., 2024; Rowlands et al., 2024). These habitats serve as important nursery areas for juvenile fish species and act as feeding grounds for ETP species and key food fish species, making seagrass beds important to local commercial fisheries. Seagrasses and their sediments are also highly efficient as carbon sinks (UNEP, 2020; Harcourt, 2018).



With about **450** species of coral, the NMC's 470 000 ha of reefs make up **4%** of the entire planet's coral reef extent.

#### CORAL REEFS

With about 450 species of coral, the NMC's 469 466 ha of reefs make up 4% of the entire planet's coral reef extent (Ghermandi et al., 2019). These habitats are rich in marine biodiversity and support several local fishing communities. Moreover, coral reefs help regulate climate change through carbon sequestration. The NMC's reefs are reported to be on a clear recovery trajectory after bleaching events, which makes the area an important seeding ground for the regeneration of future coral reefs.

### 1.9.2 MARINE STRUCTURES

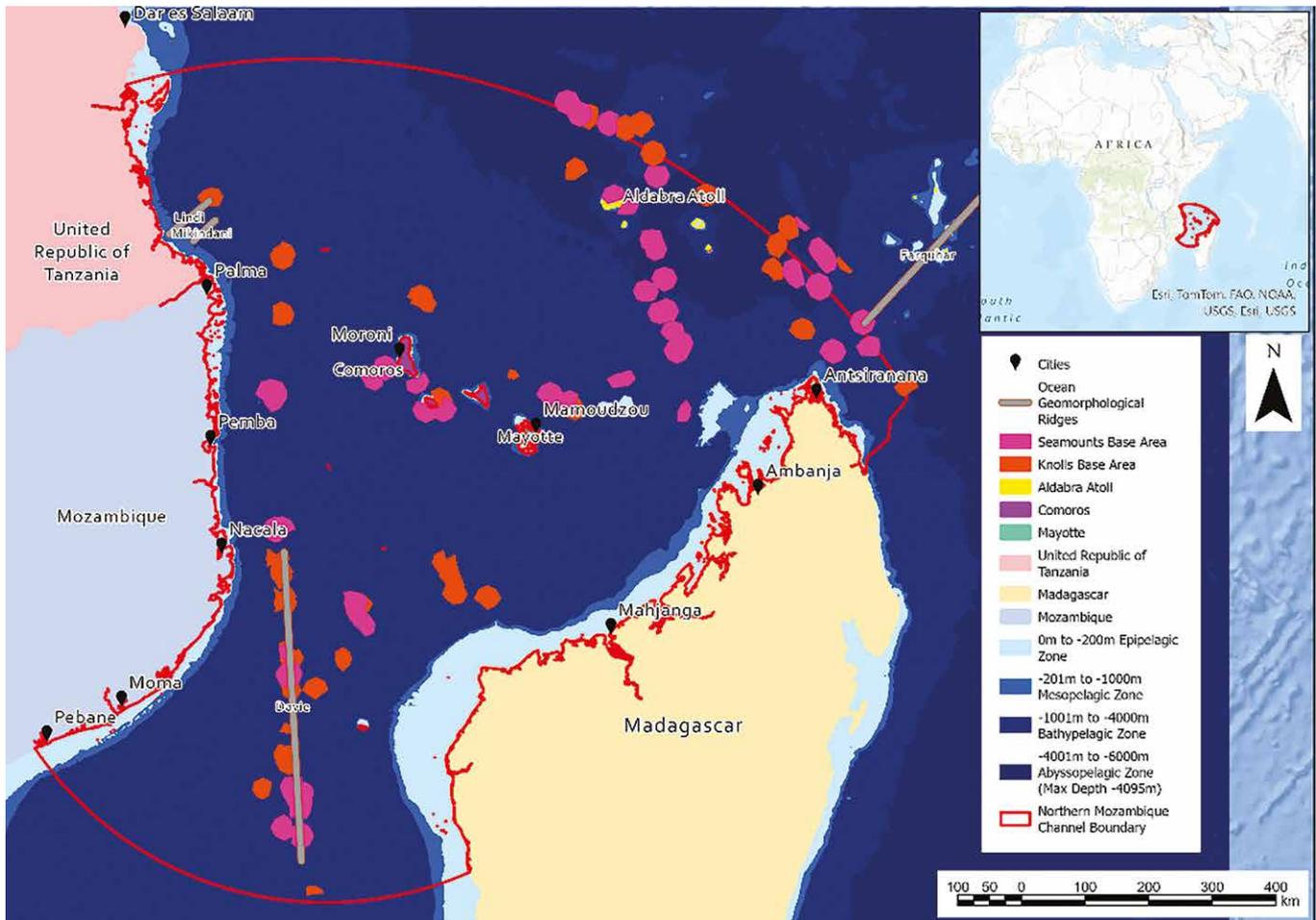
#### SHELTERED BAYS

Sheltered bays occur in areas of occasional tidal inundation, with natural features that offer protection against strong winds and waves (Adam, 2002). These areas support productive seagrass beds and mangroves, offering refuge to a diverse range of marine species and facilitating local fisheries and aquaculture.

#### SEAMOUNTS AND KNOLLS

Seamounts and knolls are hotspots for biodiversity due to their heterogeneity and the biological gradients they create in an otherwise barren environment, attracting a range of the predators that support deep-water commercial fisheries (Guduff et al., 2018; Zucchi et al., 2018). Approximately 68 seamounts and 47 knolls have been identified in the NMC area, spanning a total area of about 6 million ha and 3.5 million ha, respectively (Figure 1.3).

**FIGURE 1.3. KEY MARINE STRUCTURES IN THE NMC**



### RIDGES AND CANYONS

The Davie Ridge is the primary feature in the NMC’s deep sea, and there are several canyons present along the continental shelves of mainland countries. Submarine canyons channel nutrient-rich waters that enhance productivity, and mid-ocean ridges influence ocean circulation patterns critical to larval dispersal. In total, the NMC hosts a total of 33 ridges and canyons (GEBCO, 2023).

### SEAFLOOR SEDIMENT

The seafloor, in this assessment, refers to submerged floor from subtidal areas all the way to the deep-ocean floor. These zones may be inhabited by benthic (or deep-sea) organisms to form communities that underpin food chains and habitat stability.

This also includes cold seeps – sedimentary channels in the seafloor where dissolved and gaseous chemical compounds are released from the Earth’s mantle into the deep ocean (NOAA, 2024).

## 1.9.3 KEY SPECIES

### FISH STOCKS AND SPECIES OF CONSERVATION CONCERN

Marine vertebrates are important for food, tourism and acting as carbon reservoirs. In particular, the NMC is home to hundreds of key food fish species – both pelagic and demersal (Silas, 2022; Samoily, 2019) – that are key in ensuring food security and economic stability. The region also hosts several species of conservation concern: bony fishes such as the coelacanth; sharks and rays;

crustaceans and molluscs; marine mammals, including dugongs and about 22 different cetaceans; five different marine turtle species; and shore- and seabirds across more than 50 important bird areas (BirdLife International, 2024). Furthermore, the NMC is increasingly recognized as a crucial migration corridor for green turtles, humpback whales and the three main Indian Ocean tropical tunas: skipjack, bigeye and yellowfin tuna (Obura et al., 2018; Dalleau et al., 2019; Kalashnikova et al., 2024). Aside from attracting tourists, these species also underpin the balance of marine ecosystems by providing genetic diversity and trophic cycling.



# 02

## ECOSYSTEM SERVICES IN THE NORTHERN MOZAMBIQUE CHANNEL

Various frameworks have been developed to classify and assess the benefits derived from ecosystem services. While these frameworks differ in certain aspects, they share a fundamental structure and logic in their classification of ecosystem services, which are broadly divided into primary categories.

The Millennium Ecosystem Assessment defines four primary categories of ecosystem services:

### PROVISIONING SERVICES

These services represent direct material benefits derived from ecosystems. They also include resources like genetic and biochemical materials that contribute to human well-being and economic activity. In the NMC, relevant ecosystem services include the provision of food (such as fish from capture fisheries or aquaculture), physical materials of industry value like wood, and genetic biodiversity.

### REGULATING SERVICES

These include benefits arising from the regulation of ecosystem processes. These services are critical for maintaining the stability

and functionality of ecosystems. Ecosystems under this category in the NMC include erosion control, as well as the regulation of natural hazards such as storm surges, and the climate (both locally and globally).

### CULTURAL SERVICES

These services encompass intangible benefits that reflect the ways in which ecosystems contribute to human identity, well-being and societal cohesion. In the NMC, these include the education, art and a sense of place that ecosystems inspire for local communities. It also includes the value that healthy ecosystems can provide through ecotourism and recreational use.

### SUPPORTING SERVICES

Some frameworks include a category for services that underpin all other ecosystem functions. These services, such as soil formation and habitat provision, are essential for the functioning and resilience of ecosystems. While present in the NMC, supporting ecosystem services such as nutrient, tropic and water cycling are embedded within other categories rather than assessed independently.



## BOX 2.1.

### DEFINING BIODIVERSITY

“Biodiversity” is a term often used but, arguably, poorly understood. The point of departure for this natural capital assessment is the definition of biodiversity as provided by Noss (1990), who describes biodiversity as the composition, structure, and function of an ecosystem as follows:

- **Composition** has to do with the identity and variety of elements in a collection, and includes species lists and measures of species diversity and genetic diversity.
- **Structure** is the physical organization or pattern of a system, from habitat complexity as measured within communities to the pattern of patches and other elements at a landscape scale.
- **Function** involves ecological and evolutionary processes, including gene flow, disturbances, and nutrient cycling.

The implication of the Noss (1990) definition is that biodiversity is more than simply the number of genes, species, ecosystems, or any other group of things in a defined area. Instead, Noss favours a characterization of biodiversity that identifies the major components at several levels of organization, including composition, structure, and function. While composition primarily deals with species and genetic diversity, structure focuses on a range of complex habitat and abiotic features within a system. Function encompasses a broad array of processes and flows that enable connection, cycling, and exchange.

## 2.1 RISKS TO NATURAL ASSETS AND ECOSYSTEM SERVICES

Natural assets are subject to various risks. A comparative ecological risk assessment (CERA) was conducted to identify the risks to natural assets and to categorize them based on their likelihood and potential impact. The risks and their categories were then captured in a heatmap, with different colours allocated for “high risk and impact”, “significant risk and impact”, “medium risk and impact”, “low risk and impact” and “immaterial risk” (Table 2.1). The CERA results were used to determine the overall risk to the NMC’s ecosystem services as a function of the risks to the natural assets that deliver them (Table 2.2).

The assessment found that none of the ecosystem services were immune

to the impacts of hazards facing their underlying assets.

Four of the 11 natural assets assessed – mangrove forests, seagrass beds, fish stocks and species of conservational concern – show “significant” to “high” risk of deteriorating ability to provide ongoing ecosystem services, largely due to degradation from anthropogenic disturbances and climate change.

Of these, ecosystem services by seagrass beds appear to be the most heavily impacted. Seagrasses are highly sensitive to the effects of pollution and climate change, yet comparatively understudied – even though they support keystone species such as marine turtles and dugongs.

Mangrove forests are also under considerable pressure, putting most of the ecosystem services with which they are associated at risk. Overharvesting was found to be the most significant hazard impacting this asset, with coastal development also posing a high risk.

The pressure placed on fish stocks from unsustainable fishing practices and the commensurate destruction of fish habitats is impeding the availability of related provisioning services. This asset is at high risk, which is of particular concern given the vital role marine fish play in the diet of coastal populations. Unless addressed directly, this could have severe consequences.



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**TABLE 2.1. HEATMAP OF RISKS TO NATURAL ASSETS IN THE NMC**

HAZARD	NATURAL ASSET										
	MANGROVE FORESTS	TIDAL FLATS	ESTUARIES	SEAGRASS BEDS	CORAL REEFS	SHELTERED BAYS	SEAMOUNTS AND KNOLLS	RIDGES	SEAFLOOR SEDIMENT	FISH STOCKS	SPECIES OF CONCERN
CLIMATE CHANGE	High	High	High	High	High	Low	Low	Low	Low	High	High
SEVERE WEATHER EVENTS	High	High	High	High	High	High	Low	Medium	Medium	High	High
BIOLOGICAL HAZARD / INVASIVE SPECIES	Medium	High	High	High	High	High	Medium	Medium	Low	High	Medium
ILLEGAL, UNREPORTED AND UNREGULATED FISHING	Low	Medium	Medium	High	High	Medium	High	Medium	High	High	High
OVERHARVESTING / POACHING	High	High	Medium	High	High	Medium	High	High	Not Applicable	High	High
EXTRACTIVE ACTIVITIES	Low	Medium	Medium	High	Low	Medium	High	High	High	High	High
COASTAL DEVELOPMENT	High	High	High	High	High	High	Not Applicable	High	High	High	High
GEOPOLITICAL DISPUTES / UNCERTAINTY	Medium	Medium	High	High	Low	Medium	High	Low	Medium	High	High
ARMED CONFLICT	Medium	Low	Medium	Low	Medium	Medium	Medium	Low	Medium	Low	Medium
MARITIME TRAFFIC	Low	Low	High	High	High	High	High	Medium	Not Applicable	High	High
HYDROCARBON SPILLS	High	Medium	Medium	High	High	High	Medium	Medium	Low	High	High
MAINLAND PLASTIC POLLUTION	High	High	High	High	High	High	Medium	High	High	High	High
OTHER POLLUTION	High	High	High	High	High	High	Medium	High	Medium	High	High

KEY	High	Significant	Medium	Low	Not Applicable or Immaterial Risk
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**TABLE 2.2. HEATMAP OF RISKS TO ECOSYSTEM SERVICES DELIVERED BY NATURAL ASSETS IN THE NMC**

ECOSYSTEM SERVICE	NATURAL ASSET										
	MANGROVE FORESTS	TIDAL FLATS	ESTUARIES	SEAGRASS BEDS	CORAL REEFS	SHELTERED BAYS	SEAMOUNTS AND KNOLLS	RIDGES	SEAFLOOR SEDIMENT	FISH STOCKS	SPECIES OF CONCERN
CLIMATE REGULATION	High	High	High	High	Not Applicable	Not Applicable	Not Applicable	Not Applicable	High	Medium	Medium
NATURAL HAZARD REGULATION	High	High	High	High	Medium	Medium	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
EROSION CONTROL	High	High	High	High	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
FOOD PROVISIONING	High	High	Medium	High	Medium	Medium	Medium	Medium	Low	High	High
GENETIC BIODIVERSITY	High	High	Medium	High	Medium	Medium	Medium	Medium	Low	High	High
MATERIALS PROVISIONING	High	Medium	Not Applicable	Not Applicable	Low	Low	Not Applicable	Not Applicable	Not Applicable	Not Applicable	High
ECOTOURISM AND RECREATION	High	Not Applicable	Medium	High	High	High	Not Applicable	Not Applicable	Not Applicable	Medium	High
OTHER CULTURAL SERVICES	High	High	Medium	Low	High	High	Not Applicable	Not Applicable	Not Applicable	High	High

KEY	High	Significant	Medium	Low	Not Applicable or Immaterial Risk
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# 03

## THE VALUE AND BENEFITS OF NATURE IN THE NORTHERN MOZAMBIQUE CHANNEL

Unlike manufactured or financial capital, natural capital cannot be replicated, traded or easily restored once it has degraded beyond threshold limits. They are also not inputs that can be replaced with technology or infrastructure; they are preconditions for the health and well-being of people, nature and the planet.

The NMC's natural capital is valued at US\$277 billion. This estimate is based on 2023 data, the most recent year for which a full data set was available, discounted into perpetuity at a social discount rate of 2%. It reflects the total natural asset value of all future ecosystem services and is the value that would appear on a hypothetical balance sheet of the NMC region.

To put this value in context, the world's 60 largest financial asset managers manage, on average, an asset portfolio of US\$1 600 billion each. The NMC's natural capital is worth about 17% of this, indicating that it is large enough to warrant significant and continued conservation management investment.

## 3.1 QUANTIFYING THE VALUE OF THE NORTHERN MOZAMBIQUE CHANNEL'S ECOSYSTEM SERVICES

The NMC's 10.7 million inhabitants and visitors to the region receive ecosystem services benefits valued at US\$5.7 billion each year, give or take 30% to account for uncertainty in the underlying data and assumptions.

This value represents 50% of the NMC's regional GDP of US\$11.3 billion per year – an exceptionally high ratio. Ecosystem services that are derived from the informal sector or are not yet monetized (such as coastal protection services and biodiversity value) add an additional US\$5 billion, for a total “Blue GDP” of US\$16.3 billion per year. In other words, only US\$615 million of the value that ecosystem services currently provide is included in official GDP estimates. The other ecosystem services benefits are external to the GDP.

Table 3.1 on page 27 provides a summary of ecosystem services and natural capital value.<sup>1</sup> About 61% (US\$3.2 billion per year) of the ecosystem services value is directly conferred to NMC residents through:

- **Household fishing and coastal gleaning activities.** At US\$1.3 billion per year, the value from household fisheries (including

seagrass gleaning) for cash income and subsistence use is significant, exceeding the value of artisanal fisheries<sup>2</sup> (which comes in at US\$215 million per year) and the value of industrial fisheries (which comes in at US\$71 million per year).

- **Harvesting of mangrove timber for construction material, firewood and charcoal.** These activities –

which exceed the maximum sustainable yield – bring residents US\$189 million per year. Over the long term, these harvest levels are expected to negatively affect all ecosystem services that depend on mangrove habitats.

- **A variety of cultural services.**

These include sense of place, amenity, inspiration and recreation, which are valued at US\$1.1 billion per year.

- **Protection against natural hazards.** Services that offer protection from natural hazards such as flooding, storm surges and coastal erosion are valued at US\$638 million per year.

Visitors to the NMC region – which include scientists, investors and other stakeholders – benefit

from the remaining 39% of the ecosystem services (US\$2.2 billion per year) through:

- **Ecotourism.** The benefits from ecotourism are valued at US\$283 million per year.

- **Climate mitigation.** Services that mitigate climate change through various carbon sequestering and fixating activities are collectively valued at US\$16 million per year.

- **Biodiversity conservation.**

The value of the region's biodiversity to visitors is revealed through a willingness to pay for biodiversity conservation, which is valued at US\$1.8 billion per year.

- **Education, scientific and research services.** These are valued at US\$47 million per year.

- **Future genetic resource discovery value.** This amounts to US\$58 million per year.<sup>3</sup>

Managing the NMC's natural assets in a way that preserves their extent, condition, composition, functionality and species diversity is a necessary condition to unlock these ecosystem services values.

<sup>1</sup> “Natural capital” refers to the value of the stock of natural assets, while “ecosystem services” is a measure of the benefits that these stocks deliver over time.

<sup>2</sup> Defined as small commercial fisheries.

<sup>3</sup> Uncertainty around individual ecosystem values arises from gaps in data and knowledge, as well as statistical variation in the datasets associated with the valuation methods used.

## 3.1.1 COUNTRY AND ISLAND CONTRIBUTIONS

The six NMC countries and islands' contributions to the region's annual ecosystem services value vary based on several factors, including the extent of natural assets present, the relative size of the related industry and the size of the beneficiary population. Taking such factors into account, coastal contributions to the annual value of ecosystem services in the NMC come to US\$742 million per year for Tanzania, US\$2 billion per year for Madagascar, US\$1.7 billion per year for Mozambique, US\$425 million per year for the Comoros, US\$626 million per year for the Mayotte islands, and US\$137 million per year for Seychelles.

### BOX 3.2.

## FRAMEWORKS USED IN THIS REPORT

### ***Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity***

The concept of ecosystem services was first established in the Millennium Ecosystem Assessment (MEA), where ecosystems were considered as assets that yielded a flow of services beneficial to people, much like other forms of capital (MEA, 2005). The MEA also facilitated the development of several frameworks for reviewing and evaluating ecosystem services. While later definitions have expanded and refined the concept, the classification proposed by the MEA remains a foundational framework for understanding and valuing these services. For the purposes of this analysis, the MEA framework, complemented by elements of The Economics of Ecosystems and Biodiversity, was used to develop a natural asset register that details the extent of natural assets in the Northern Mozambique Channel.

### ***Comparative ecological risk assessment***

The comparative ecological risk assessment methodology (Shatkin & Qian, 2004) is used to describe and categorize the risks to each ecosystem service across all relevant ecosystems.

### ***System of Environmental-Economic Accounting***

The System of Environmental-Economic Accounting (SEEA) is the globally recognized statistical standard for calculating how much the natural environment contributes to economies and how much economic activity can impact local ecosystems (UNSD, 2014, 2021, 2023; United Nations, 2021).

### ***Production function approach***

Where relevant, a production function approach was used to value ecosystem services as inputs for producing final goods and services. Using a production function approach requires detailed ecological and economic data to accurately model the relationships between ecosystem services and production outputs. As an example, mangroves are assessed based on how they enhance coastal fisheries by providing habitat and cycling nutrients, both factors that directly influence fish productivity. A production function approach allows for both the direct and indirect links between ecological function and economic output to be considered.

**TABLE 3.1. CURRENT VALUE OF NATURAL CAPITAL AND RELATED ECOSYSTEM SERVICES IN THE NMC**

	CATEGORY	ECOSYSTEM SERVICE	ECOSYSTEM SERVICE VALUE (US\$ MILLION/YEAR)	NATURAL CAPITAL VALUE (US\$ MILLION)	VARIANCE
PROVISIONING SERVICES	Wild fish and other natural aquatic biomass provisioning services	Fish catch and coastal gleaning (household level)	1 262	61 825	30%
		Fish catch (artisanal)	215	10 518	10%
		Fish catch (industrial)	71	3 493	10%
		Genetic resources	58	2 863	50%
	Wood provisioning services	Firewood and charcoal	40	1 952	30%
		Construction material	149	7 304	30%
CULTURAL SERVICES	Recreation-related services	Ecotourism	283	13 875	20%
		Cultural services to local residents (sense of place, spiritual, heritage, recreation)	1 074	52 628	30%
	Education services	Education, scientific and research services	47	2 312	50%
	Biodiversity value	Biodiversity conservation value	1 797	88 180	34%
REGULATING SERVICES	Global climate regulation services	Carbon sequestration	16	760	45%
	Soil and sediment retention services (soil erosion control services and landslide mitigation services)		Valued indirectly through a production function approach		
	Coastal protection services	Coastal protection	638	31 290	30%
	Nursery population and habitat maintenance services		Valued indirectly through a production function approach		
<b>TOTAL</b>			<b>5 650</b>	<b>277 000</b>	<b>30%</b>

## 3.2 PROVISIONING SERVICES

The NMC's ecosystems currently provide people with various provisioning services, including food, a source of income, genetic resources, and wood for building and cooking/heating. However, these benefits are not always conferred to the local population, as is the case with genetic resources.

### 3.2.1 FOOD AND INCOME

Food provisioning is one of the most critical ecosystem services provided by the fisheries of the NMC, supplying millions of people with a primary source of protein and nutrients. Coastal communities in the region, particularly in rural areas, rely heavily on fish as an affordable and accessible food source, contributing to both food security and nutritional diversity.

The artisanal and small-scale fisheries of the NMC play a crucial role in sustaining local diets, while industrial fleets contribute to income from national and international markets.<sup>4</sup> This section is based on data from the IOTC. Fishing at the household level and other marine activities that yield provisioning services to coastal residents but are not tracked by the IOTC, such as harvesting mussels, are also discussed below.

#### ARTISANAL AND INDUSTRIAL FISHERIES

An estimated 29 700 tonnes of fish were caught by artisanal and coastal state industrial fleets in the NMC in 2023 (IOTC, 2024). Of this, 22 400 tonnes were caught by artisanal fisheries, and 7 300 tonnes were caught by industrial fleets. The higher catch volumes from distant water fishing nations have been excluded from this assessment.

Artisanal and industrial fisheries contribute about US\$287 million to the region each year. About US\$215.8 million of this comes from artisanal fishing, while industrial fishing contributes about US\$71.2 million. These figures are based on the most recent available data from the IOTC, which does not contain data for all NMC countries (Table 3.2). As a result, the level of variation in the estimated value

of artisanal fish catch, based on conservative modelling choices, is around 29%, while the level of variation for industrial catch is about 40%.

Artisanal and industrial fleets both target tuna and tuna-like fish, including yellowfin, albacore, bigeye and skipjack tunas. However, most of the fish caught in the NMC – small pelagics, crustaceans and shrimps – are caught by artisanal fisheries, which continue to be a vital part of daily life in coastal communities. Maintaining this ecosystem service depends on sustainable management practices to prevent overexploitation and ensure long-term food security for dependent populations.

**TABLE 3.2. FISHERIES ECOSYSTEM SERVICE VALUES BY COUNTRY/ISLAND GROUP (US\$ MILLION PER YEAR)**

COUNTRY/ISLAND	ARTISANAL ECOSYSTEM SERVICE VALUE	INDUSTRIAL ECOSYSTEM SERVICE VALUE	TOTAL ECOSYSTEM SERVICE VALUE
Tanzania	27.9	54.5	82.4
Madagascar	26.1	0.1	26.2
Mozambique	71.8	15.3	87.1
Comoros	85.4	No data	85.4
Seychelles	1.2	1.3	2.5
Mayotte islands	3.4	No data	3.4
<b>Total fisheries value</b>	<b>215.8</b>	<b>71.2</b>	<b>287.0</b>

<sup>4</sup> For the purpose of this assessment, fisheries within the NMC are broadly categorized into **household fisheries**, which include small-scale, traditional fishing operations (undertaken to meet community nutrition needs and to sell to local and international markets); **artisanal fisheries**, which comprise vessels less than 24 metres (m) in overall length (LOA) operating exclusively within their own EEZ and using a wide range of fishing gear; and **industrial fisheries**, which comprise vessels equal to or longer than 24 m LOA or vessels less than 24 m LOA operating **outside their national EEZ** using longline, purse seine or large gillnet fishing gear.

## HOUSEHOLD FISHERIES AND COASTAL GLEANING

In addition to artisanal fishing, coastal households are also able to derive food and income from household fishing and seagrass gleaning. These supplement household diets and are important sources of livelihoods for women, with household-level fishing and coastal gleaning activities alone attracting an estimated overall ecosystem service value of US\$1.2 billion per year across the NMC.

Seagrass gleaning involves harvesting molluscs and crustaceans by hand from intertidal zones (Barnes & Rawlinson, 2009; Machava-António et al., 2020). In East Africa, this custom dates back to prehistoric times and serves as an important source of subsistence. In the NMC, invertebrates such as oysters, clams, mussels, snails and crabs are typically collected (Chitará-Nhandimo et al., 2022).

Driven by climate change, severe weather and coastal development, the decline in seagrass bed – habitats for sea snails and crabs in particular – has resulted in a decrease in

economic activity for many households dependent on gleaning (Nordlund et al., 2010). These hazards also impact other harvesting activities that are supported by mangroves (excluding wood harvesting) and coral reefs. However, the extent of these impacts is not known due to a general gap in knowledge surrounding the quantities and market values of invertebrate species harvested through gleaning (Unsworth & Cullen, 2010).

### 3.2.2 GENETIC RESOURCES

The NMC is a relatively pristine marine ecosystem with high levels of known biodiversity, meaning that there is a high possibility of untapped potential in terms of genetic resources that could be used to produce novel biochemical products.

In the NMC, the Davie Ridge has contributed to high levels of genetic variation. Based on a literature review that derived the values of ecosystem services per area of habitat, the overall value of genetic resources in the NMC was determined to be US\$58 million per year and primarily concentrated

around Madagascar and Mozambique, which account for US\$26 million and US\$18 million per year, respectively. However, the beneficiaries of such resources are less likely to be local economies and communities than scientists and biotechnology firms worldwide.

### 3.2.3 WOOD PROVISIONING SERVICES

Mangrove forests in the NMC are crucial to the livelihoods of coastal communities and serve as a valuable source of timber. This wood provisioning service supports a wide range of uses, including construction, fuelwood (charcoal and firewood), fish smoking, boatbuilding, fish traps and artisanal crafts. Some mangrove species are especially valuable due to their high-density wood, resistance to rot and suitability for marine construction. For many communities, mangrove timber is not only a subsistence resource but also a source of income, especially through the informal timber trade.

The valuation distinguished between timber used for construction and that used for firewood and charcoal production. Combined, the annual value of these ecosystem services for the NMC is US\$188.9 million, while the natural capital asset value is US\$9 255 million (discounted at a 2% social discount rate). However, it should be noted that current levels of harvesting are not sustainable and are reducing the extent and condition of mangrove assets, undermining the future value of this service and the value that mangroves indirectly contribute to biodiversity conservation value (as discussed in Chapter 3.5), climate regulation (Chapter 3.4.1) and coastal protection (Chapter 3.4.2).



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## 3.3 CULTURAL SERVICES

Cultural services are the largely intangible benefits of the ecosystem. These benefits are the least understood and most difficult to evaluate yet are also extremely valuable. Cultural services can be divided according to who benefits from the service: ecotourism directly benefits visitors to the region (with indirect material benefits for local communities and states in the form of jobs, tourism income and taxes and fees), while a sense of place, a spiritual connection and heritage are conferred to locals in the area.

### 3.3.1 ECOTOURISM

Tourism is a key part of coastal life and local economies in the NMC. The region's beaches, coral reefs, marine wildlife and cultural landmarks attract visitors from around the world, including from within the region. While tourism includes a wide range of spending, from transport and food to guided experiences, this study focused on accommodation as a simple (yet reliable) way to estimate the value of tourism across the region. To do this, the total number of hotel and lodging beds in the region was identified (20 856), along with average occupancy rates and room prices. From that, the estimated value of tourism based on accommodation is just over US\$283 million per year. Most of this value is based in Tanzania, which attracts US\$119.3 million per year, due to its relatively well-developed tourism industry.

### 3.3.2 LOCAL RESIDENT CULTURAL SERVICES (SENSE OF PLACE; SPIRITUAL, HERITAGE AND RECREATIONAL VALUE)

To estimate the value of cultural ecosystem services to locals, the study used the "time value of daily leisure". This approach captures the unsung role ecosystems play in supporting both individual quality of life and community identity.

The total estimated value of recreation across the NMC is about US\$1 073 million per year. Mozambique and Madagascar account for the largest shares (US\$405 million and US\$401 million, respectively) due to their long coastlines, large

coastal populations and strong links to natural spaces. Tanzania follows with an estimated US\$153 million, reflecting the strong presence of coastal communities who use nearby ecosystems for leisure and reflection. Though smaller in size, Comoros still accounts for about US\$89 million and the Mayotte islands for US\$26 million, showing that recreational value is significant even in more compact island settings.

### 3.3.3 KNOWLEDGE SERVICES

As a marine biodiversity hotspot with a high number of endemic and functionally diverse species supported by complex habitats like coral reefs, seagrass beds, mangrove forests and largely understudied seamounts, the NMC has high potential to advance human scientific understanding and contribute to the generation of knowledge. However, whether local communities benefit from these services depends to a large degree on the level to which these communities have access to such information and opportunities. For this reason, improving the accessibility of knowledge is an important outcome for any NMC conservation plan.

The total ecosystem service value from marine research in the NMC amounts to US\$47 million per year. This is averaged across the six countries/islands as just under US\$8 million per country/island per year.



## 3.4 REGULATING SERVICES

The countries and islands of the NMC increasingly face climate-related natural hazards such as cyclones, flooding, ocean surges and coastal erosion. These events affect coastal communities by disrupting their ability to fish and earn an income from tourism activities, while national economies need to redirect funding to emergency response and the reconstruction of damaged infrastructure rather than long-term development projects. The cumulative effect of these recurring disasters translates into millions of dollars in economic losses (Meek & Nene, 2021; WWF, 2023).

### 3.4.1 CLIMATE REGULATION SERVICES

The value of climate regulation in the NMC is determined by examining four mechanisms for blue carbon sequestration and storage: oceanic phytoplankton, which converts atmospheric carbon dioxide into organic matter via photosynthesis; seagrass beds, which bury carbon in the ocean floor; mangroves, which have a per-hectare carbon storage rate that exceeds tropical rainforests; and marine vertebrates, which sequester carbon in their bodies.

The valuation found that, in total, 1.16 million tonnes of carbon are sequestered in the NMC each year, with mangroves capturing the most carbon (691 598 tonnes per year) followed by seagrasses (236 478 tonnes per year). Combined, climate regulation services are valued at US\$15.22 million per year, distributed evenly among the six countries/islands within the NMC.



**1.16**  
million tonnes  
of carbon are  
sequestered  
in the NMC  
each year.

**TABLE 3.3. VALUATION OF CLIMATE REGULATING SERVICES IN THE NMC (IN TONNES OF CARBON PER YEAR)**

ASSET INVOLVED IN STORAGE OR FIXATION	TANZANIA	MADAGASCAR	MOZAMBIQUE	COMOROS	SEYCHELLES	MAYOTTE ISLANDS	TOTAL NMC
Phytoplankton	22 334	88 233	50 450	29 984	27 182	12 167	<b>230 350</b>
Seagrass sediment	38 602	128 386	69 046	52	3 091	393	<b>239 570</b>
Mangroves	112 695	376 383	201 216	153	2 958	1 151	<b>694 556</b>
Marine vertebrates	7 827	2 493	8 269	8 101	400	319	<b>27 409<sup>5</sup></b>
<b>Total carbon sequestered or fixated</b>	<b>181 458</b>	<b>595 495</b>	<b>328 981</b>	<b>38 290</b>	<b>33 631</b>	<b>14 030</b>	<b>1 191 885</b>
<b>Total value of carbon sequestration/fixation (in US\$ million per year)</b>	<b>2.4</b>	<b>8.0</b>	<b>4.3</b>	<b>0.3</b>	<b>0.4</b>	<b>0.1</b>	<b>15.5<sup>6</sup></b>

<sup>5</sup> The total value was determined based on fish stock and fish catch in the NMC. This was then apportioned to each country/island based on their relative portion of total catch.

<sup>6</sup> The total value is calculated for the NMC based on total carbon sequestration under each of the four key blue carbon mechanisms. This is then apportioned to each country/island using a weighted average approach.

## 3.4.2 COASTAL PROTECTION SERVICES

Ecological infrastructure such as mangrove forests, coral reefs and coastal wetlands play a crucial role in mitigating the impacts of extreme weather by acting as natural barriers against coastal erosion, storm surges and rising sea levels. In doing so, they reduce the damage caused by strong storms and cyclones while providing critical habitats for marine and coastal biodiversity. In many cases, these ecosystems serve as the first line of defence for vulnerable populations, reducing the need for expensive artificial barriers or infrastructure interventions.

For this analysis, the value of coastal protection was calculated by assessing the potential cost savings from avoided flood damages due to the presence of mangroves (USAID, 2017). Based on this evaluation, total protection due to the presence of mangroves amounted to US\$638 million, the benefits of which would confer to those countries that are at the greatest risk of floods and have the greatest mangrove cover, that is, Mozambique and Madagascar (Table 3.4).



**Ecological infrastructure such as mangrove forests play a crucial role in mitigating the impacts of extreme weather.**

**TABLE 3.4. THE AREA OF COASTAL MANGROVES, PROBABILITY OF A FLOOD IN A YEAR, AND VALUE OF PROTECTION OFFERED BY MANGROVES, BY COUNTRY/ISLAND**

COUNTRY/ISLAND	MANGROVE COVERAGE (HECTARES)	LIKELIHOOD OF FLOODING IN A YEAR*	PROTECTION ATTRIBUTED TO FLOODS PROTECTION (US\$)
Tanzania	11 613	1.95	58 067 283
Madagascar	67 216	1.86	336 082 348
Mozambique	33 274	1.87	238 566 337
Comoros	50	0.25	916 005
Seychelles	50	1.20	251 712
Mayotte islands	201	0.05	4 153 360
		<b>Total</b>	<b>638 037 045</b>

\* A 0.25 value implies a 25% probability.

## 3.5 BIODIVERSITY CONSERVATION VALUE

The concept of biodiversity encompasses both the variety, richness and evenness of species in an ecosystem, as well as the compositional, structural and functional elements of its ecological processes (such as interspecific interactions, nutrient cycles and natural disturbances). Whereas ecosystem services are assessed based on the individual services they contribute to people and economies, biodiversity conservation value is based on the health of ecological processes involving underlying natural assets.

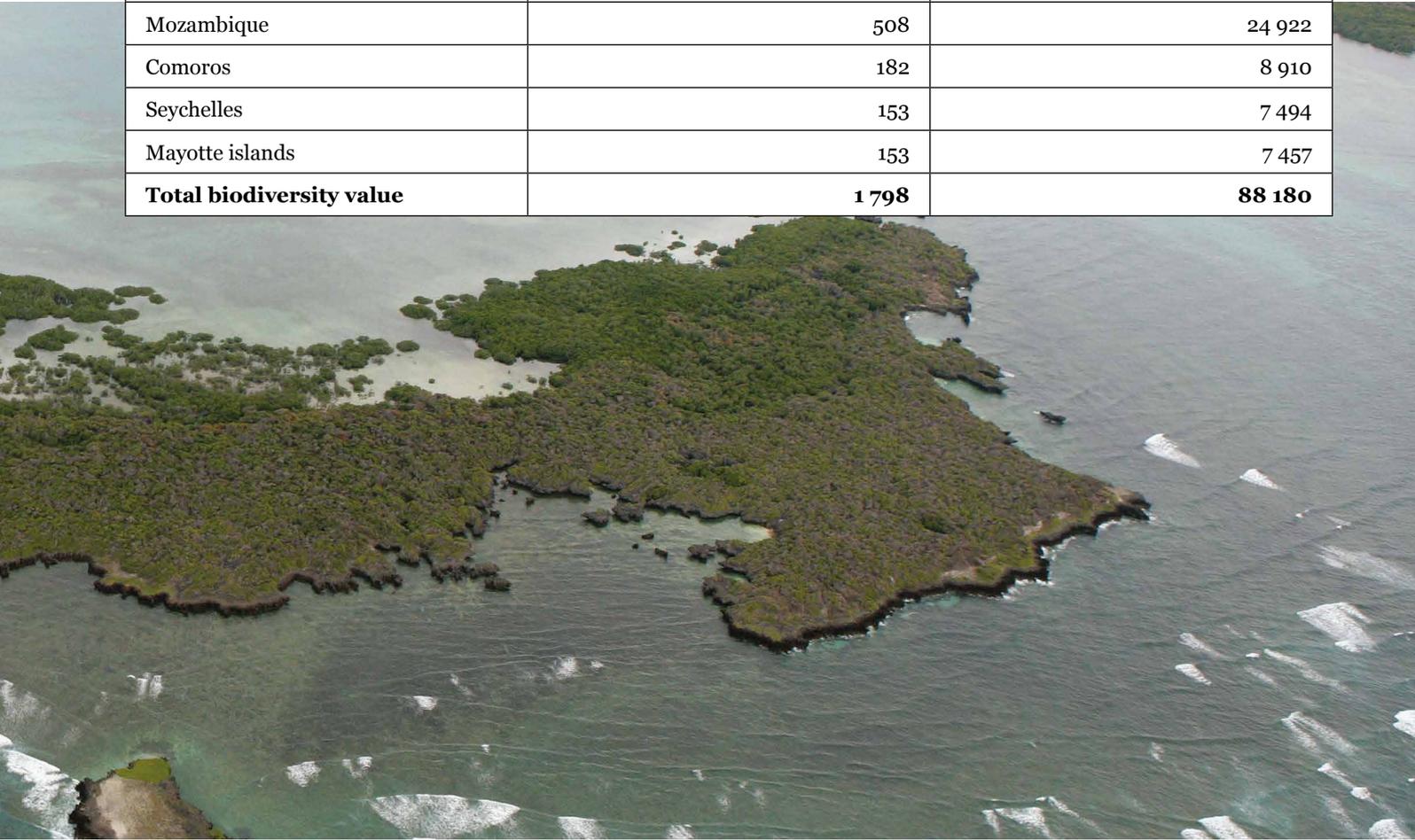
“Willingness to pay” for biodiversity conservation value has emerged as a metric for providers of green and blue capital to quantify the expected fundamental demand for biodiversity, and thus to quantify value, especially when these decisions involve investing in nature through, for example, blended finance vehicles.

The NMC’s biodiversity conservation value of about US\$88.2 billion is estimated based on historical data reflecting conservation and asset managers’ willingness to invest in

the protection of targeted habitats and species globally. This value is highly concentrated in NMC due to its high levels of biodiversity (measured by species richness and relative abundance) and its unique ecosystem attributes of composition, structure and function. The total ecosystem services value is assessed as about US\$1.8 billion per year.

**TABLE 3.5. BIODIVERSITY CONSERVATION VALUE BY COUNTRY/ISLAND**

COUNTRY/ISLAND	ECOSYSTEM SERVICES VALUE (US\$ MILLION PER YEAR)	NATURAL CAPITAL VALUE (US\$ MILLION)
Tanzania	136	6 697
Madagascar	667	32 700
Mozambique	508	24 922
Comoros	182	8 910
Seychelles	153	7 494
Mayotte islands	153	7 457
<b>Total biodiversity value</b>	<b>1 798</b>	<b>88 180</b>



## 3.6 CONTRIBUTION TO REGIONAL ECONOMIES

The NMC region contributes US\$11.3 billion per year, or 9.3%, to the total country-wide GDP of its member countries. Because the Comoros and the Mayotte islands fall fully within the NMC, 100% of their GDP is dependent on the region. The NMC accounts for about 12% of Madagascar and Mozambique’s GDPs, while Seychelles and Tanzania have a significantly smaller dependence, at 0.2% and 2.3% respectively.

Adjusting the total NMC GDP to include the NMC natural asset-based ecosystem services provides a “Blue GDP” valued at US\$16.3 billion per year. Blue GDP can be defined as the official GDP adjusted to include all ecosystem services externalities in formal sectors (such as fishing, ecotourism and education), informal sectors and other unmonetized ecosystem services.



The NMC region contributes **US\$11.3 billion** per year to the total country-wide GDP of its member countries.

**TABLE 3.6. COMPARISON OF OFFICIAL GDP FOR EACH COUNTRY/ISLAND GROUP AND PROPORTION CONTRIBUTED BY THE NMC**

COUNTRY/ISLAND GROUP	OFFICIAL GDP FOR THE WHOLE COUNTRY/ISLAND GROUP (US\$ MILLION)	OFFICIAL GDP FOR THE NMC ZONE (US\$ MILLION)	NMC GDP AS A PERCENT OF TOTAL GDP
Tanzania	77 852	1 758	2.3%
Madagascar	15 790	1 945	12.3%
Mozambique	20 999	2 512	12.0%
Comoros	1 350	1 345	100%
Seychelles	2 276	4.46	0.2%
Mayotte islands	3 740	3 740	100%
<b>Total</b>	<b>122 006</b>	<b>11 305</b>	<b>9.3%</b>



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# 04

## SEEKING SOLUTIONS: INTEGRATED OCEAN GOVERNANCE AND THE NMC BLUE HUB

The complexity of overlapping uses and pressures within the NMC underscore the urgent need for anticipatory and integrated ocean governance to ensure the long-term sustainability of its marine and coastal resources.

The NMC encompasses a range of highly productive and diverse marine ecosystems, supports substantial fisheries, and lies along key international shipping routes. In recent years, the region has also emerged as a focal point for blue economy initiatives, offering increasing opportunities in marine resource-based development.

Marine spatial planning (MSP) offers a structured and future-oriented framework to promote sustainable use of the region's ocean resources. It facilitates the rational, proactive

allocation of marine space by clarifying spatial uses over time, identifying responsible actors, and accounting for the cumulative impacts of human activities. By balancing competing objectives (that is, economic development, environmental protection and social equity), MSP promotes a transparent, inclusive and scientifically grounded process that supports both current needs and equity that can be sustained in the long-term (IOC-UNESCO & European Commission, 2021; FAO, 2021).

**Marine spatial planning (MSP) offers a structured and future-oriented framework to promote sustainable use of the region's ocean resources.**



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## 4.1 CURRENT STATUS OF INTEGRATED OCEAN GOVERNANCE IN THE NORTHERN MOZAMBIQUE CHANNEL

The NMC member countries and islands, with coordination by the Nairobi Convention Secretariat, have come together to develop a shared Vision and Roadmap for the region, as well as a dedicated set of tailored Technical Guidelines to support ecosystem-based MSP (UNEP-Nairobi Convention et al., 2025). These guidelines build on the regional *Western Indian Ocean Marine Spatial Planning Strategy* and reflect relevant international frameworks, including the United Nations' Sustainable Development Goals and the Convention on Biological Diversity. Crucially, the guidelines lay the institutional and technical foundations required for coordinated

and inclusive marine governance, serving as a roadmap towards the establishment of a comprehensive MSP regime in the region. Without such a proactive and coherent spatial planning framework, the NMC faces the risk of fragmented governance, competing sectoral interests, and irreversible natural capital degradation.



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### BOX 4.1.

#### A SHARED VISION FOR THE NORTHERN MOZAMBIQUE CHANNEL

**The Northern Mozambique Channel's (NMC) formal vision statement, as articulated in its 2025 Vision and Roadmap, is:**

*A sustainable future where healthy ecosystems support, and are supported by, thriving local communities and a vibrant blue economy which optimises the value of ocean resources within the NMC over the long term without jeopardising use for future generations.*

The Vision and Roadmap identify healthy marine ecosystems, resilient coastal communities, a sustainable blue economy and collaborative ocean governance as key strategic objectives for the region (UNEP-Nairobi Convention et al., 2025).

#### **Technical guidelines**

The technical guidelines offer structured guidance around five strategic objectives:

1. The establishment of harmonized governance and legal frameworks
2. The standardization of MSP processes and data systems across the NMC
3. The promotion of integrated ocean management that reconciles ecological protection with economic development
4. The advancement of poverty alleviation through inclusive blue economy initiatives
5. The strengthening of institutional capacity and sharing knowledge at both national and regional levels.

These objectives aim to ensure cross-sectoral and cross-jurisdictional coherence, laying the groundwork for effective integrated ocean governance in the region.



## 4.2 BLUE ECONOMY TECHNICAL AND INVESTMENT HUB

To support the delivery of the NMC Vision and Roadmap, a blue economy technical and investment hub, provisionally named the NMC Blue Hub, is proposed. The proposed hub, constituted as a special-purpose vehicle, will provide cross-cutting and integrative services to NMC member countries and islands to support the delivery of the Roadmap and ultimately the delivery of a sustainable and inclusive blue economy across the region. Specifically, the NMC Blue Hub would:

- Provide scientific services to help NMC members fast-track MSP development processes
- Provide scientific services to support MSP implementation
- Own the supporting equipment needed for long-term scientific data

collection and monitoring. This could include research vessels, autonomous underwater vehicles, drones, and computer software and hardware needed for data storage and analyses

- Share data with NMC member teams
- Support MSP governance across the NMC members through policy-provision services and legal-support services
- Actively develop a pipeline of investable blue economy projects, taking these projects through a stage-gate process to the point where they are feasible bankable projects
- Run a nature-based solutions accelerator programme.

The NMC Blue Hub could ultimately form the basis of a secretariat for shared integrated ocean governance of the NMC.

## 4.3 ANTICIPATED COSTS

Effectively implementing integrated ocean governance in the NMC region – and so increasing the extent and condition of natural capital – will cost about US\$18.6 million per year. This includes US\$5.2 million per year for strengthening local institutions (covering staffing, infrastructure, governance and enforcement) and US\$13.4 million per year for operational expenditure associated with the NMC Blue Hub.

In addition to these recurrent costs, initial capital outlay amounting to at least US\$2.4 million will be required. This includes a capital investment of US\$0.5 million for local institutional strengthening and US\$0.9 million for scientific equipment, data systems and office infrastructure to establish the NMC Blue Hub.

## 4.4 INVESTMENT OPPORTUNITIES

Blue economy investment opportunities potentially totalling more than US\$6 billion have been identified. These include potential investments in mariculture, ecotourism, fisheries cold chains, woodlots and agroforestry, household energy solutions, carbon and biodiversity markets, and insurance-related services. If fully implemented, these investments would increase Blue GDP in the NMC by about US\$1 billion per year, which is 8.5% of the current official GDP of the NMC.

### 4.4.1 MARICULTURE

Community-based mariculture projects have shown potential to improve livelihoods, despite technical and market challenges. These projects include crab fattening, as well as the farming of seaweed, shrimp, and sea cucumbers, among others. The capital investment required for specific mariculture projects varies widely based on factors such as the species cultivated, production systems used, geographic location and scale of operation. Overall, the investment potential of mariculture in the NMC is US\$250 million.

### 4.4.2 ECOTOURISM

A typical 40-bed mid- to high-end eco-lodge requires capital investments of between US\$15 million and US\$20 million. Overall, the investment potential of ecotourism in the NMC is US\$250 million.

### 4.4.3 FISHERIES COLD CHAIN

Setting up an ice-making plant for fish cold storage involves a range of capital investments, which vary based on production capacity, technology and infrastructure requirements. A small-scale facility capable of producing between five and 10 tonnes of ice a day would require investments that range from about US\$23 000 to US\$45 000, while a medium-scale facility capable of producing between 20 and 50 tonnes a day would require investments of between US\$120 000 and US\$290 000. The total investment potential of fisheries cold chains in the NMC is US\$250 million.

### 4.4.4 WOODLOT OR AGROFORESTRY

Timber for construction purposes remain an important commodity within the NMC. To conserve mangroves, substitute products need to be identified. Precedents of successful and sustainable woodlot and agroforestry projects exist in many East African countries. The total investment potential of agroforestry in the NMC is US\$100 million.

### 4.4.5 HOUSEHOLD ENERGY

Households that rely on firewood and charcoal need improved household energy equipment such as solar power for lighting and for charging batteries, as well as improved wood-burning stoves. The total investment potential of household energy in the NMC is US\$500 million.

### 4.4.6 CARBON MARKETS

The carbon sink potential in the NMC is valued at least US\$15 million per year (see Chapter 4.4.1 for more detail on how this value was obtained). This revenue is equivalent to a once-off carbon investment of US\$50 million. It is possible that this may increase in parallel with other investment initiatives, assuming no additionality.

### 4.4.7 BIODIVERSITY CONSERVATION MARKETS

The biodiversity “willingness-to-pay” value of the NMC, based on biodiversity demand studies, is estimated at least US\$1.7 billion per year. It is to be noted that markets for biodiversity credits and similar instruments are in their infancy in most parts of the world. The large value estimated for the NMC here reflects the region’s high levels of biodiversity, as measured by species richness and relative abundance, and its unique attributes of ecosystem composition, structure and function. This revenue is equivalent to a biodiversity investment exceeding US\$3 billion in the NMC. These would include pollution-control investments that mitigate risks to the biotic and abiotic components of biodiversity. However, biodiversity remains unmonetized, as markets are still in early development.

### 4.4.8 INSURANCE-RELATED SERVICES

The insurance value associated with the regulating ecosystem services is valued at least US\$1.6 billion per year, which is equivalent to a biodiversity investment exceeding US\$1.3 billion in the NMC. As with biodiversity, regulating services are not yet fully monetized.

## 4.5 PROGRESS INDICATORS

The NMC initiative is aligned with the Western Indian Ocean Ecosystem Indicator Monitoring Framework, which uses indicators that have been categorized into four thematic areas: ecosystem health, socioeconomics, governance and pressures.

**Ecosystem health indicators** include coral reef condition; the extent and condition of mangroves and seagrasses; water quality; fish biomass and species diversity. These indicators are effective at assessing the resilience of marine ecosystems and identifying areas in need of restoration or enhanced protection.

**Socioeconomic indicators** include fisheries employment and income; food security and nutrition linked to marine resources; community participation in marine governance; and tourism revenue and the number of visitors to marine protected areas. These indicators reflect the extent to which coastal communities are sustainably and equitably benefiting from ocean resources.

**Governance indicators** include the existence and implementation of MSP frameworks; stakeholder engagement levels; the adoption of ecosystem-based management approaches; and

the integration of traditional and local knowledge in marine governance. These are critical for evaluating the effectiveness and inclusiveness of marine governance systems across the region.

**Pressure indicators** include fishing effort and gear types; coastal development and land use change, pollution loads from land-based sources; and climate-related stressors such as sea surface temperature anomalies.



# 05

## MODELLING THE BENEFITS OF INVESTING IN INTEGRATED OCEAN GOVERNANCE

Investing in ecosystems like mangrove forests, seagrass beds and coral reefs has the potential to increase and improve the extent and condition of natural capital assets, resulting in further additional benefits being gained.

The extent of the potential gains from investing in marine ecosystems can be assessed through a benefit-cost analysis that models two future scenarios and comparing the outcomes. The two scenarios are:

- **The Conservative Investment Scenario**, where investments are made to implement the NMC Roadmap actions (as costed in Chapter 4.3) and into select natural capital – supporting ecotourism, rehabilitating mangroves, establishing woodlots and developing fisheries cold chains – in order to reverse the ecological degradation of the past two decades (see Chapter 4.4 for descriptions of these investments).
- **The No Action Scenario**, where no investments are made in ecosystems over the next 25 years.

## 5.1 DATA SOURCES AND MODELLING METHODOLOGY

This benefit-cost analysis is based on the data obtained through the valuation of ecosystems services and corresponding economic impact assessment, as discussed in Chapter 3 and captured in Table 3.1. The likely costs of assessed investments were obtained from desktop research and other sources.

An ecosystem services production function model was run by adjusting the appropriate independent variables. A time series of economy-wide models, using official NMC member statistics, for each country/ island and their contributions to the NMC's blue economy were also developed.



## 5.2 KEY FINDINGS UNDER CONSERVATIVE INVESTMENT SCENARIO

The modelling exercise revealed that, under the Conservative Investment Scenario: GDP would grow faster, creating more jobs than if no action were taken; the benefit-cost ratio of conservative investments would outpace that of traditional infrastructure investments; and the informal sector would be empowered to contribute more to GDP.

### 1 GDP WOULD GROW FASTER, CREATING MORE JOBS

The NMC's GDP contribution is expected to grow at an estimated compound annual growth rate of 5.1% per year, which is 0.4% greater than the 4.7% of the No Action Scenario (Table 5.1). By 2050, more than 100 000 additional jobs will have been directly and indirectly created.

### 2 FISHING, ECOTOURISM AND EDUCATION SERVICES WOULD CONTRIBUTE AN ADDITIONAL US\$144 MILLION PER YEAR TO THE REGION'S FORMAL GDP BY 2050

Under the Conservative Investment Scenario, commercial fishing, ecotourism and education services will contribute nearly US\$1.7 billion to the formal economy against just more than US\$1.5 billion under a No Action Scenario (Table 5.2).

The Conservative Investment Scenario will also have a multiplier effect of 6.6 on GDP by 2050. This means that for every US\$1 invested in implementing the NMC Blue Hub and rolling out NMC Roadmap actions to improve the region's natural capital, there will be an estimated return of \$6.60 in overall economic activity within the NMC. The investments contribute directly to economic output and create ripple effects as the benefits derived from ecosystem service investments flow through various supply chains, creating jobs, income and enhancing productivity and amplifying the original investment input.

### 3 THE INFORMAL ECONOMY WOULD CONTRIBUTE AN ADDITIONAL US\$213 MILLION TO BLUE GDP

As noted earlier, Blue GDP is official GDP adjusted to include all ocean-

based ecosystem services, including in informal sectors. The informal sector's contribution to Blue GDP through ecosystem services consumed under the Conservative Investment Scenario is estimated at nearly US\$5.8 billion per year by 2050 – which represents a 5.1% compound annual growth rate (Table 5.1).

This will drive many associated benefits, including likely improvement in the quality of, and accessibility to, natural spaces, making them more valuable sources of cultural ecosystem services. The growth in formal sectors such as ecotourism could also allow households to migrate their economic activities away from environmentally intensive informal practices such as overfishing or unsustainable wood harvesting towards more formal economic activities, so promoting economic inclusion.

### 4 THE ECONOMIC BENEFITS WOULD EXCEED THOSE OF SIMILAR INVESTMENTS INTO TRADITIONAL BUILT INFRASTRUCTURE

The benefit-cost ratio under the Conservative Investment Scenario is expected to be 18:1 (Table 5.3). This is an exceptionally high return on investment that is not often observed in typical built infrastructure investment projects, which tend to have a benefit-cost ratio of between 2:1 and 6:1 (EPRI, 2025; López et al., 2013; USDOT, 2024).

The ratios estimated for the NMC are relatively high because:

- **Natural asset investments yield high benefits.** Natural assets and ecosystems have longer lifespans than traditional infrastructure and do not depreciate. Their biological regeneration attributes yield growth

over a longer period of time while demanding much lower operation and maintenance costs, if any at all.

- **Most NMC blue economy sectors have multiple dependencies on various natural capital classes.**

An investment in natural assets therefore has a significant multiplier effect across multiple economic sectors.

- **Ecosystem services that were previously “invisible” to markets are now becoming recognized.** This is due to the increasing monetization of ecosystem services and the emergence of markets such as carbon credits, biodiversity credits, and insurance-based valuation of natural defences, which is making ecological infrastructure investments more comparable with investments in built infrastructure.

That said, high benefit-cost ratios should be interpreted with caution. As Flyvbjerg (2013) cautions, cost overruns and benefit shortfalls are common in the actual economics of large projects when compared to the planning stage. In the case of the NMC, data uncertainty exists in several areas, limiting the accuracy of the benefit-cost analysis. However, this uncertainty has largely been accounted for by modelling a Conservative Investment Scenario rather than a more ambitious scenario in which the NMC's Roadmap implementation starts gaining momentum, attracting further investment over time.

**TABLE 5.1. COMPARISON OF THE ECONOMIC IMPACT OF THE NO ACTION SCENARIO AND CONSERVATIVE INVESTMENT SCENARIO ON NMC GDP IN 2050 (US\$ MILLION, NOMINAL VALUES)<sup>7</sup>**

COUNTRY/ISLAND GROUP	2023 BASELINE	NO ACTION SCENARIO IN 2050	CONSERVATIVE INVESTMENT SCENARIO IN 2050
Tanzania	1 758	6 408	7 250
Madagascar	1 945	5 128	5 811
Mozambique	2 512	9 859	11 150
Comoros	1 345	3 290	3 730
Seychelles	4	10	11
Mayotte islands	3 740	13 974	15 808
<b>NMC GDP total</b>	<b>11 305</b>	<b>38 670</b>	<b>43 759</b>
<b>Ecosystem services value</b>	<b>5 650</b>	<b>10 180</b>	<b>11 212</b>
<b>NMC Blue GDP</b>	<b>16 340</b>	<b>47 335</b>	<b>53 311</b>
Compound annual growth rate (%)	n/a	4.7%	5.1%
Additional jobs created	n/a	n/a	100 000

**TABLE 5.2. OFFICIAL GDP AND BLUE GDP IN 2023 AND UNDER THE NO ACTION AND CONSERVATIVE INVESTMENT SCENARIOS IN 2050 (US\$ MILLION, NOMINAL VALUES)**

INDICATOR	2023 BASELINE	NO ACTION SCENARIO	CONSERVATIVE INVESTMENT SCENARIO
Official GDP of the NMC region	11 305	38 670	43 759
<i>Of which: formal fishing, ecotourism and education services</i>	616	1 516	1 660
Ecosystem services consumed in the informal economy	2 525	5 575	5 788
Unmonetized ecosystem services (externalities) to GDP	2 510	3 090	3 764
<b>NMC Blue GDP</b>	<b>16 340</b>	<b>47 335</b>	<b>53 311</b>

**TABLE 5.3. SUMMARY OF BENEFIT-COST RATIO UNDER CONSERVATIVE INVESTMENT SCENARIO IN 2050**

INDICATOR	NO ACTION SCENARIO	CONSERVATIVE INVESTMENT SCENARIO
Net present value (NPV) of ecosystem services (US\$ million)	147 000	156 000
NPV of total benefits due to Conservative Investment into ecosystem services (US\$ million)	0	8 891
NPV of total costs (US\$ million)	0	457
NPV of net benefits (US\$ million)	n/a	8 434
<b>Benefit-cost ratio</b>	<b>n/a</b>	<b>18:1</b>

<sup>7</sup> Nominal values imply that the values have been adjusted upwards to account for forecast inflationary effects.

# 06

## RECOMMENDATIONS

The following suggestions, which are based on the findings of this report, support the effective implementation of integrated ocean governance in the NMC.

## 1 ESTABLISH THE NMC BLUE HUB

The NMC Blue Hub would serve as a secretariat for integrated ocean governance of the NMC. It would have the following key functions, among others:

- Support harmonized governance and management of the NMC
- Provide legal services to facilitate harmonization of key areas of legislation, including advocating for legal and regulatory frameworks that will enable sustainable blue economy investments
- Strengthen local institutions by sharing capacities for conservation and management of natural assets
- Ensure that MSP processes are harmonized and that connectivity and shared natural capital are taken into account in national MSP processes
- Support the protection of key natural assets located within the NMC boundaries (informed by a systematic conservation plan)
- Undertake shared research and monitoring activities, including sharing of data.

## 2 ESTABLISH A TECHNICAL ASSISTANCE FACILITY TO DRIVE BLUE ECONOMY INVESTMENT

Establishing a technical assistance facility in the NMC would play a pivotal role in driving blue economy investments with a strong emphasis on the sustainable economic development of coastal communities. The facility would provide targeted support to strengthen local enterprises, build capacity for inclusive business models, and enhance access to finance for community-led initiatives. By bridging the gap between investors and coastal stakeholders, it would help unlock sustainable livelihoods, promote the responsible use of marine resources, and ensure that blue economy growth translates into equitable social and environmental benefits for the region's coastal communities.

## 3 CREATE A NATURE-BASED SOLUTIONS ACCELERATOR TO SUPPORT INVESTMENT READINESS OF CARBON AND BIODIVERSITY CREDIT PROJECTS

A nature-based solutions accelerator in the NMC would strengthen the investment readiness of carbon- and biodiversity-credit projects. By offering tailored technical assistance, sharing knowledge and skills, and providing access to financial expertise, the accelerator would help local project developers overcome barriers to scale, improve the credibility and transparency of their initiatives, and align with international standards. This approach would not only unlock sustainable finance for coastal and marine conservation, but would also generate tangible benefits for local communities, enhance climate resilience, and protect globally significant biodiversity in the region.

## 4 EXPLORE PARAMETRIC INSURANCE

Blue carbon ecosystems such as mangrove forests store significant amounts of carbon. This allows for the generation of verified carbon credits that can be sold on international markets. Revenue from these credit sales could then be used to finance the insurance premiums for parametric insurance products. These specialized insurance products provide rapid payouts after predefined climate-related triggers, such as an extreme storm with winds that reach a specific wind speed, or when sea temperatures exceed a critical threshold for coral bleaching. Because the payout is tied to a specific, measurable event trigger rather than a lengthy damage assessment, funds are disbursed quickly, ensuring timely financial support for affected coastal communities and for critical restoration work such as coral reef restoration. This approach not only creates a sustainable funding stream for the protection and restoration of priceless natural capital, but also helps to build sustainable

enterprises, ultimately supporting the adaptive capacity of coastal communities while reinforcing the economic value of conserving nature.

## CONCLUSION

Implementing integrated ocean governance is critical for the protection of biodiversity in the NMC. Securing investment to enable the establishment of the NMC Blue Hub would fast-track this process by ensuring that countries have the necessary technical and administrative support to finalize marine spatial plans and secure further investment into the region's sustainable blue economy.

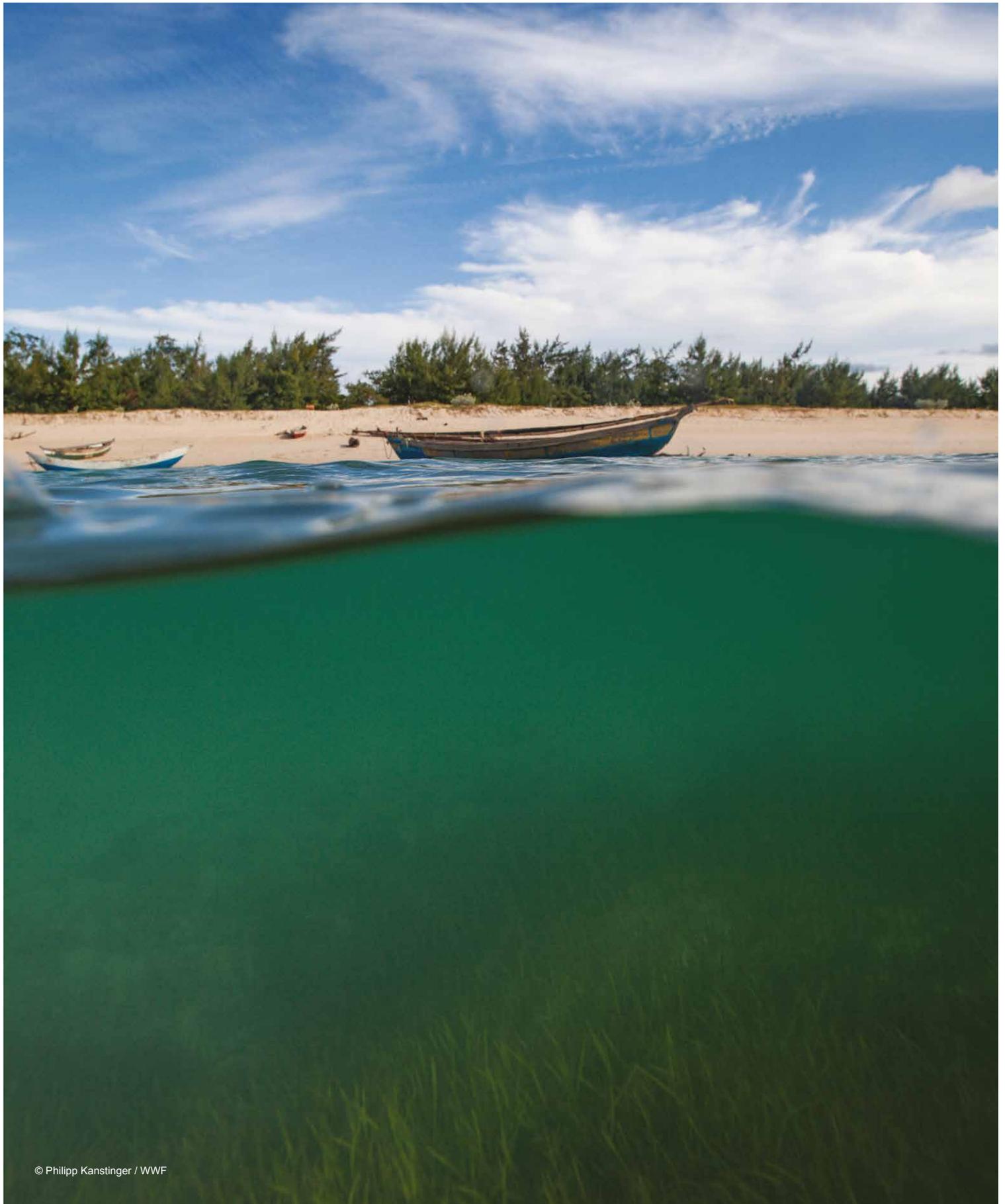
Regardless of which direction is chosen for financing the NMC Blue Hub, this would need to be captured in a Blue Economy Investment Strategy and Plan that is grounded in the NMC Vision and Roadmap and Guidelines, and that aligns with the *Western Indian Ocean Regional Ocean Governance Strategy*. A successful Blue Economy Investment Strategy and Plan would consider all key natural asset classes, namely coral reefs; mangrove forests; seagrass beds; coastal wetlands and estuaries; beaches and sand dunes; seamounts and knolls, ridges and canyons; seafloor (sediment); fish stocks; and marine biodiversity.

A successfully implemented NMC Blue Hub, potentially complemented by the other facilities suggested in this chapter, would support ecosystem services across the Western Indian Ocean region. The investment vehicles developed could be deployed to similar asset classes in Western Indian Ocean region, and its institutional infrastructure would support and harmonize with those of all other Western Indian Ocean countries. In this way, the NMC Blue Hub has the potential to serve as a regional model for integrated ocean governance, with ripple effects across the wider Western Indian Ocean.

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