med PROGRAMME

Nature-based solutions and ecosystem-based adaptation in the Mediterranean

Incorporating insights from two regional trainings in Montenegro and Morocco

GEF MedProgramme SCCF Project

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SCCF
Enhancing regional climate change adaptation in the Mediterranean Marine and Coastal Areas

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Table of contents

Table of illustrations

FIGURES

TABLES

List of acronyms

CAMP	Coastal Area Management Programme
CBD	Convention on Biological Diversity
CC	Climate Change
EbA	Ecosystem-based Adaptation
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GWP-Med	Global Water Partnership – Mediterranean
ICZM	Integrated Coastal Zone Management
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
MAP	Mediterranean Action Plan
MedECC	Mediterranean Experts on Climate and environmental Change
METLE	Ministry of Equipment, Transport, Logistics and Water
MPA	Marine Protected Area
NbS	Nature-based Solutions
NGO	Non-Governmental Organisation
PAP/RAC	Priority Action Programme/Regional Activity Centre
RED	Regional Environment Directorates
SD	Sustainable Development
SDGs	Sustainable Development Goals
SCCF	Special Climate Change Fund
TTA	Tangier-Tetouan-Al Hoceima
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

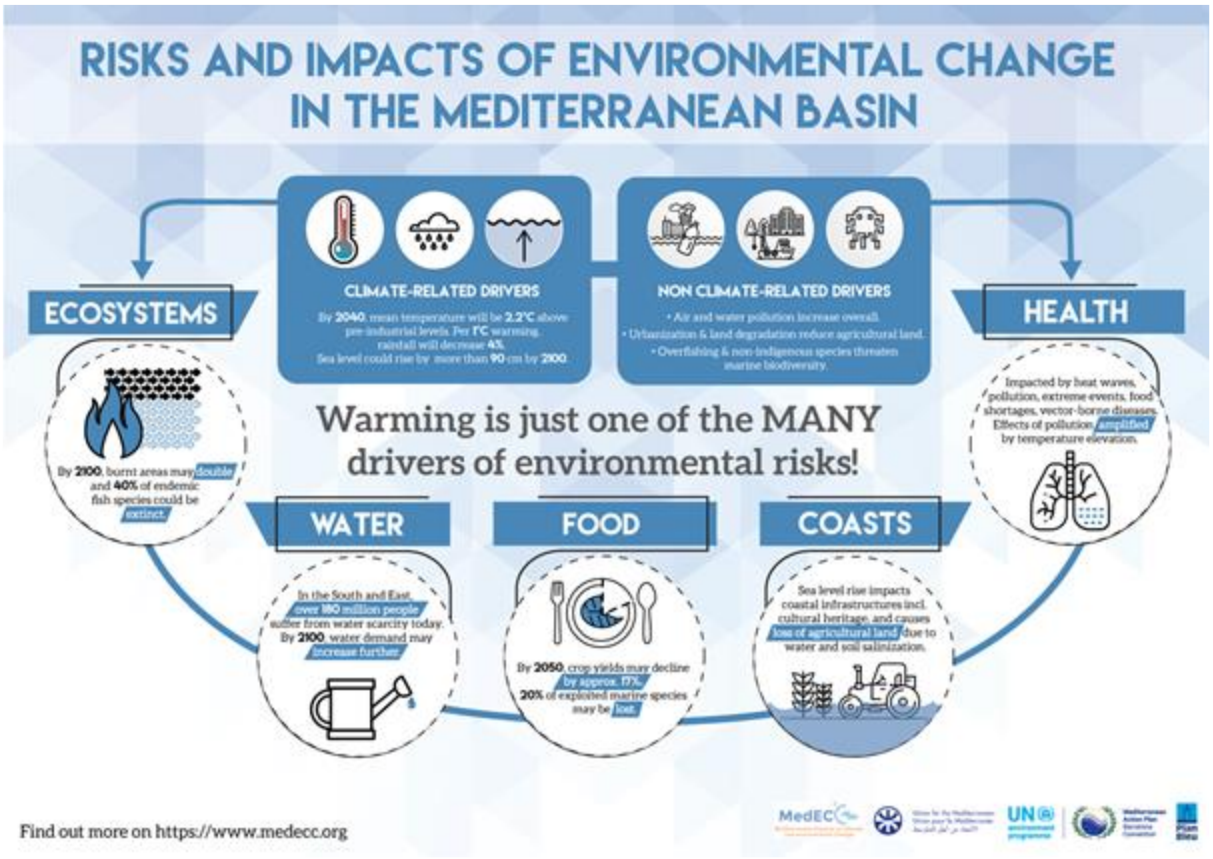
Introduction

BACKGROUND

The Mediterranean region is facing numerous challenges linked to climate, environmental and social change. It is particularly exposed to anthropogenic risks caused by climate change (rising atmospheric and sea temperatures, changes in rainfall, extreme weather events, rising sea levels, etc.), but also by population growth, pollution, the unsustainable use and degradation of land and sea, and the introduction of non-native species (Figure 1) (MedECC, 2020).

These impacts affect both natural ecosystems and the livelihoods of local populations, and are expected to worsen in the coming decades, particularly if global warming exceeds pre-industrial levels by 1.5 to 2°C or more.

Figure 1. Risks and impacts of environmental change in the Mediterranean basin



Source: MedECC 2020

This is particularly the case in coastal areas, where population density has continued to increase at an unsustainable rate over the past decade, and where built-up areas have more than doubled within one kilometre of the sea (UNEP/MAP and Plan Bleu, 2020), exposing populations, ecosystems and economic interests to various meteorological and marine hazards, and making them more vulnerable to coastal risks.

An assessment of these risks on a Mediterranean scale has shown that they may be even higher along the southern and eastern coastlines, where the adaptation capacity is often limited by less developed economic and institutional conditions (MedECC, 2024).

The latest assessment report by the Intergovernmental Panel on Climate Change (IPCC, 2022) states that unless urgent and drastic measures are taken at an international level in response to climate change, we risk serious, pervasive and irreversible impacts on human and natural systems, threatening ecosystems and biodiversity, slowing growth, compromising food security, damaging human health and increasing social inequalities. However, even under the most optimistic mitigation scenarios, adaptation is still necessary to reduce vulnerability to the current or expected effects of climate change. There is particular urgency for developing countries, which are already feeling the effects of climate

change and are especially vulnerable due to a combination of factors, including their geographical location and climate conditions, heavy dependence on natural resources and limited capacity to adapt to a changing climate. Given the urgency of the current climate situation, local and regional authorities need to adapt without delay to these trends, which we now know are inevitable. The question is no longer whether to adapt, but how to do so.

Nature-based Solutions (NbS) are defined as "actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits" (IUCN 2020). They offer a range of coastal adaptation options, including biodiversity conservation measures, climate and disaster risk reduction, and enhanced climate resilience. Often, they also offer flexible alternatives that are more socially sustainable and more profitable than conventional "grey" adaptation solutions. NbS can also contribute to climate mitigation and generally offer many advantages to improve water and food security.

When designed holistically and in a landscape approach, NbS can also effectively come alongside more technical approaches, since they take into account the need not only for greater resilience to climate change in coastal areas, but also sound management of natural resources, ecosystem conservation and restoration and the promotion of sustainable livelihoods. The way in which the NbS are designed also makes them more inclusive by striving to "leave no-one behind" and working towards greater transparency and fairness. NbS are therefore a key factor in the adaptation capacity of Mediterranean coastlines, with beneficial ecological effects.

GEF MEDPROGRAMME

The Mediterranean Sea Programme (MedProgramme): "Enhancing Environmental Security (MedProgramme) by the Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP) is the first multi-focal programme initiative by GEF in the Mediterranean basin. The programme aims to operationalise priority actions to reduce major transboundary environmental stresses in the region's coastal zones, while strengthening climate resilience and water security and improving the health and livelihoods of coastal populations. The MedProgramme is implemented by UNEP/MAP in Albania, Algeria, Bosnia-Herzegovina, Egypt, Lebanon, Libya, Montenegro, Morocco, Turkey and Tunisia. Its 8 Sub-Projects cover four different Global Environment Facility focal areas (International Waters [IW], Biodiversity [BD], Chemicals and Waste [CW] and Climate Change [CC]), and address a wide range of development and societal issues. They target players from a wide range of sectors, including banking institutions, the private sector, government and non-governmental organisations, industry, research, the media and other various organisations.

Within this programme, the SCCF Project (Sub-project financed by the Special Climate Change Fund) called "Enhancing regional climate change adaptation in the Mediterranean marine and coastal areas" focuses particularly on coastal climate change adaptation in Albania, Algeria, Libya, Montenegro, Morocco and Tunisia. Plan Bleu focuses especially on two regional hotspots: the Tangier-Tetouan-Al Hoceima Region in Morocco, and Kotor Bay in Montenegro.

Plan Bleu is one of the Regional Activity Centres of the Mediterranean Action Plan (MAP) of the United Nations Environment Programme (UNEP), working under the Barcelona Convention (UNEP/MAP, 1995). Thus, one of the main activities of Plan Bleu is the revision and implementation of the Mediterranean Strategy for Sustainable Development (MSSD), which also holds several thematical interlinkages with the activities undertaken in the frame of the GEF MedProgramme (UNEP/MAP, 2016; 2025).

In collaboration with national partners, Plan Bleu, PAP/RAC and GWP-Med have organised participatory activities led by experts on coastal adaptation solutions in these areas from multiple perspectives, including technical, economic, governance, legal and financial studies and activities.

In line with the SCCF project objective of "helping countries enhance the resilience of Mediterranean marine and coastal areas to the impacts of climate change", two training workshops focusing on Nature-based Solutions (NbS) for coastal adaptation in the Mediterranean were organised in Kotor, Montenegro on 3-4 October, and in Tangier, Morocco on 4-5 November, involving coastal decision-makers and managers, along with a wide range of stakeholders from academia, civil society, the private sector and international organisations.

OBJECTIVES

Nature-based Solutions (NbS) have multiple objectives, with the aim of enhancing ecological and social resilience to the challenges of climate change, while supporting the conservation of natural resources and ecosystems. These objectives were set out from the outset at the NbS workshops in Tangier, Morocco, and Kotor, Montenegro, with the aim of extending these initiatives to SCCF countries in the Mediterranean.

The main objective of the workshops was to build capacity and enhance the knowledge of Ecosystem-based Adaptation (EbA), and NbS. Presentations by experts were an opportunity to share knowledge on best practice for NbS and EbA, and to present and integrate certain approaches, such as the landscape approach. Another important objective was to

connect global projects to local contexts and projects, in order to ensure proper knowledge sharing. A further major objective was to raise awareness of climate risks in the regions, including a gender perspective.

The part of the workshops dedicated to presentations by experts was followed by group activities. One of the key objectives of these group activities was to **actively introduce participants to the eight criteria and indicators** for the IUCN NbS (IUCN, 2020), not only by learning them, but by inviting participants to reflect on these criteria and their indicators. Participants had to use critical thinking to **diagnose their presence** or absence in the current strategies of SCCF countries. This reflective and analytical work will be used to assess the effective integration of NbS in existing policies. Another key objective is to **create a think tank** that will work together to develop recommendations and strategies through **participatory research**. This process involves drawing on the cross-disciplinary expertise of participants from a variety of backgrounds to enrich discussions and produce solutions tailored to local and regional realities.

- **Enhancing resilience to climate risks**: NbS aim to reduce the vulnerability of ecosystems and local communities to the impacts of climate change, in particular by managing water resources, protecting coastal zones and reducing the risks of flooding and erosion. Extending these initiatives to SCCF countries in the Mediterranean would enhance the resilience of coastal and maritime areas, which are particularly exposed to the effects of global warming.
- **Restoring and preserving marine and land ecosystems**: Another key objective of NbS is to restore ecosystems, such as seagrass meadows, wetlands, dunes and coastal forests. These ecosystems play a crucial role in carbon sequestration, coastline protection and in maintaining biodiversity. The experience of pilot projects in Tangier, Morocco and in Kotor, Montenegro, should be extended to other Mediterranean countries to support the regeneration of coastal and marine ecosystems.
- **Supporting local economies through the sustainable management of natural resources**: NbS also aim to promote the sustainable management of natural resources while supporting local economies. For example, seaweed and shellfish farming projects not only restore marine ecosystems but also help reduce fishing and increase no-take zones to meet the 30 by 30 target by the end of the decade. These initiatives are essential for developing sustainable economic models in Mediterranean countries, while encouraging the inclusive and participatory management of resources by local communities.
- **Enhancing cooperation and local governance**: Another objective of NbS is to establish **co-management** programmes, such as those run by the Moroccan National Agency for Water and Forests (ANEF), **AGIR** and various international partners, to enhance collaboration between local, national and international stakeholders. Extending these models to other SCCF countries in the Mediterranean will require stronger governance mechanisms for the shared and sustainable management of protected areas and natural resources.
- **Developing training and capacity building in Ecosystem-based Adaptation (EbA)**: One of the objectives of NbS is to ensure the effective implementation of appropriate solutions, which require specific expertise in **EbA**. This involves training local stakeholders and managers of protected areas to ensure a thorough understanding of ecological dynamics and best practices for restoring and managing ecosystems. Without this training, NbS cannot be fully applied. This kind of capacity building is therefore essential in Mediterranean countries to maximise the impact of NbS.

In summary, the aim of these workshops is to extend these successful experiences to SCCF countries in the Mediterranean, in order to enhance the resilience of ecosystems, support local economies and promote the sustainable management of natural resources, within a framework of regional cooperation and participatory governance. The objectives of the workshops focused on training, participatory reflection and cross-disciplinary collaboration, and are essential to ensure the successful and widespread implementation of NbS in the region.

1 Climate risks on the SCCF pilot sites (Morocco and Montenegro)

As mentioned in the introduction, the Mediterranean region will experience multiple stresses due to higher temperatures, a 10-20% drop in rainfall, increased soil degradation and growing desertification, as well as more severe droughts and storms, which will have an inevitable impact on coastal areas. Climate change is expected to pose serious risks to ecosystems and important economic sectors, such as summer seaside tourism, agriculture, aquaculture and fisheries.

The climate risks facing the coastal zone of the Tangier-Tetouan-Al Hoceima (TTA) region in Morocco and Kotor Bay in Montenegro were identified and assessed through projects to draft coastal plans for these regions as part of the MedProgramme.

1.1 CLIMATE RISKS IN THE TANGIER-TETOUAN-AL HOCEIMA COASTAL REGION (MOROCCO)

The coastline of the TTA region is facing a number of major social and economic issues: population (2.5 million inhabitants), industry and logistics, holiday resorts and tourism, agriculture, fisheries, etc. It is also home to remarkable biodiversity and provides numerous ecosystem services. However, the shift in population and activities in the country from inland to the coast since the beginning of the century has contributed to the strong urban development of coastlines, increasing their exposure to various meteorological and marine hazards and thereby reducing their resilience to climate risks. It should also be noted that some unbridled development and urbanisation projects on the coast could jeopardise the future of coastal reservoirs of biodiversity, whose ecological status and the services they provide are already severely degraded.

Analysis of coastal risks has clearly shown that the TTA coastline is highly exposed to natural hazards, due to its very diverse morphology, its geodynamic context and the space-time irregularity of its climate characteristics. In addition to these natural determinants, the sustained development dynamics, accompanied by more intense exploitation of natural resources, have led to ecological imbalances that threaten sustainable development and the sustainability of resources. Multi-criteria analysis of the combination of all these factors has identified the hot spots and areas sensitive to coastal risks linked to climate change. These are mainly the low-lying areas of the Bay of Tangier where the industrial zone is located, the city of Tetouan on the banks of Oued Martil, Fnideq, part of the Atlantic coastline of Tangier Medina, along with a few more localised areas, such as Azla and the area around Ksar El Kebir.

Very high flooding risk levels have been recorded in the valley of Oued Martil, especially around the city of Tetouan, the valley of Oued Loukkos, especially near Ksar el Kebir, the rivers that flow into the Bay of Tangier, the alluvial plains of Oued El Hachef and Oued Rhiss-Nekkor, and all the other thalwegs of Mediterranean rivers.

The alluvial plains of Loukkos, Martil, and the low-lying areas of Tangier Assilah present the highest levels of multiple risks (flooding, sea flooding and pollution).

1.2 CLIMATE RISKS IN KOTOR BAY (MONTENEGRO)

Kotor Bay is one of Montenegro's most precious treasures, with unique cultural heritage and UNESCO World Heritage status. This region has considerable growth potential, which is essential to the development of Montenegrin society. It is nevertheless characterised by complex relationships between human activities and the natural environment, which often result in significant pressure on natural resources. It has become one of Montenegro's most vulnerable maritime areas.

Montenegro is experiencing increasing migratory pressure along its coastline. In coastal municipalities, there has been significant depopulation in the hinterland and population growth in coastal urban centres. In the Kotor Bay region, this is reflected in high population density along the bay's coastline. All these pressures make Kotor Bay extremely vulnerable, particularly due to its partial incursion inland, the limited exchange of bodies of water with the open sea and the richness of its marine life.

The main drivers of stress are anthropogenic factors, due to the high population and density in the narrow coastal zone, the development of tourism and the accompanying urbanisation, limited impacts of industry (shipbuilding), maritime activities and the recent growth in nautical tourism and cruise ships. The impacts of climate change will exacerbate these pressures, threatening the economic gains the country has made since independence in 2006.

According to climate projections, the total quantity of average annual rainfall is set to fall by -5% in the southern region, while the frequency of flash flooding is set to increase. The frequency and extent of droughts are also likely to increase in the future, impacting water supplies, particularly with population growth and an increased number of foreign tourists. Agriculture will suffer production losses due to irrigation water shortages, while livestock production and welfare will also be impacted.

The results of the climate model show an intensification of extreme weather events accompanied by intense rainfall and strong winds. This represents a high level of vulnerability for people, ecosystems and biodiversity, as well as damage caused by strong winds and increased risks of storm surges.

The main risks in Kotor Bay are mainly the following multiple risks:

- Storms and heavy rain combined with a strong southerly wind, causing flooding and river erosion;
- Drought followed by heat waves, extreme temperatures and forest fires.

2 Fundamental concepts of Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NbS)

In order to address climate risks in the Mediterranean region, this chapter expands on the key concepts of Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NbS), along with the interconnections between these concepts.

2.1 WHAT IS ECOSYSTEM-BASED ADAPTATION AND HOW CAN IT BE APPLIED TO MEDITERRANEAN COASTAL ZONES?

Ecosystem-based adaptation (EbA) is an approach that uses biodiversity and ecosystem services to help communities adapt to the adverse effects of climate change (CBD, 2019), particularly in vulnerable areas such as Mediterranean coastal zones. The Mediterranean is especially sensitive to climate change because of its semi-arid climate, high population density and economic dependence on coastal ecosystems. The application of EbA in these areas consists of the restoration, conservation and management of ecosystems to protect coastal communities from sea-level rise, erosion and extreme weather conditions, while sustaining biodiversity and ecosystem services.

Implementing EbA strategies not only improves coastal resilience, but also promotes sustainable livelihoods and enhances biodiversity. This approach is cost-effective and offers associated benefits such as carbon sequestration, improved water quality and better recreational opportunities, which are particularly valuable in the Mediterranean where tourism and fishing are economically important. To obtain these benefits, EbA projects must take place over the long term, as the benefits of EbA are often only obtained after 10 years (Kassam, NbS Workshop in Tangier, 2024).

According to A. Kassam (NbS Workshop, Tangier, 2024), “EbA is the application of Nature-based Solutions within a systemic approach, with the aim of enhancing the resilience or capacity of populations to adapt to climate change”.

2.2 WHAT ARE NATURE-BASED SOLUTIONS? HOW CAN THEY SUPPORT EBA AND INFORM INTEGRATED COASTAL ZONE MANAGEMENT?

The term "Nature-based Solutions" (NbS) emerged in the late 2000s as a new concept aimed at simultaneously addressing and mitigating societal, economic and ecological challenges. This conceptualisation was started by World Bank and supported by the International Union for Conservation of Nature (IUCN) and the European Commission (El Harrak & Lemaitre, 2023).

In 2022, the United Nations Environment Assembly (UNEA) adopted a multilaterally-agreed definition of NbS: “Nature-based Solutions are actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits”.

They are strategies that use natural processes and ecosystems to address societal, environmental and economic challenges, such as climate change, biodiversity loss, water security, food security and disaster risk reduction. By protecting, restoring or sustainably managing ecosystems, these solutions harness the power of nature to deliver benefits to both people and the environment (Figure 2) (IUCN, 2020).

NbS therefore offer significant potential for supporting EbA in Mediterranean coastal zones by enhancing resilience to climate change and addressing ecological and socio-economic challenges.

Figure 2. Nature-based Solutions defined by IUCN

2.2.1 How can NbS effectively support EbA and mitigate climate risks in Mediterranean coastal zones?

NbS can play an essential role in mitigating climate risks in Mediterranean coastal zones, which are particularly vulnerable to impacts such as rising temperatures, reduced rainfall, rising sea levels and extreme weather events.

1. Restoration of coastal wetlands

Since 1970, half of Mediterranean wetlands have been lost or degraded (MedECC, 2020). Restoring these zones through NbS initiatives can rebuild natural buffer zones and biodiversity hotspots. Coastal wetlands (estuaries, deltas, lagoons, coastal marshes) provide essential ecosystem services such as flood regulation, water filtration and carbon sequestration. They act as natural buffers that absorb storm surges and reduce the impacts of flooding, protect from erosion and support biodiversity, providing habitats for migratory birds and aquatic species, which also supports local fisheries and eco-tourism.

Figure 3. Adaptive management of lagoons and marshes on the former site of the Camargue saltworks, Fance

(cf. Douchin, Workshop Kotor, 2024)

2. Restoration of dunes and beaches

Coastal dunes and beaches act as natural barriers, protecting inland areas from waves and rising sea levels. They also help retain freshwater, which contributes to recharging coastal aquifers with groundwater.

Restoring these ecosystems using NbS can stabilise coastlines and prevent coastal erosion. It is possible in areas where the dune ridge has been totally or partially eliminated, or is fragmented by erosion channels.

The most common method consists of passive sand trapping systems, using dead branches or sand fences, which are generally biodegradable (Figure 4). Windbreaks are widely used, mainly because of their relatively low cost, ease of construction and effectiveness in depositing sand.

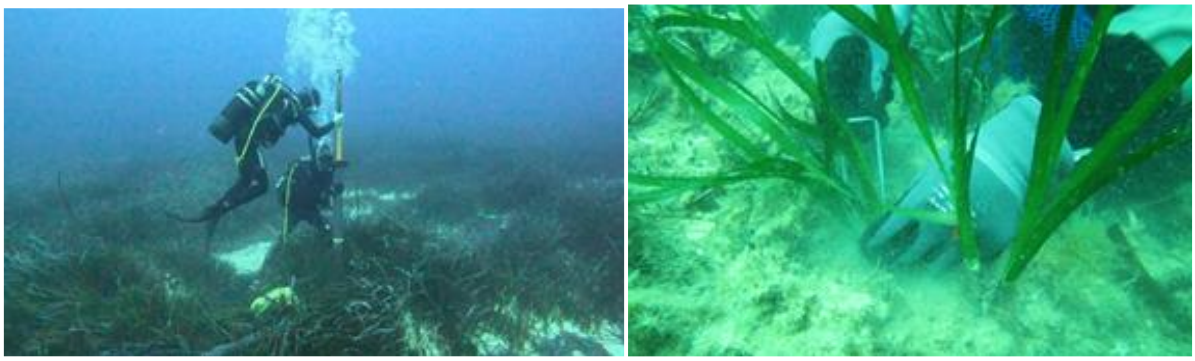
Once the dunes have been rebuilt, they are fixed by planting dune species (such as sand couch-grass or beachgrass) which, in their natural state, ensure the formation and stabilisation of dunes.

Figure 4. Example of sand fences used in coastal region

3. Conservation of seagrass meadows[1] and coral reefs

Seagrass meadows and coral reefs help reduce wave energy, lessen erosion and provide nurseries for marine life. In the Mediterranean, conservation and restoration efforts for *Posidonia oceanica* seagrass meadows not only support marine biodiversity, but also improve resilience by stabilising sediments, reducing wave energy and storing carbon. Coral reefs are limited in the Mediterranean, but it is essential to protect any existing habitats.

Figure 5. Seagrass monitoring and restoration activities



Source: Artemis.

4. Construction of living shorelines

Living shorelines, such as oyster reefs or planted marshlands, are natural alternatives to hard coastal defences (such as sea walls). They can absorb wave action while promoting biodiversity and improving water quality.

In the Mediterranean, the use of locally adapted materials and species in living shoreline projects can protect communities from erosion and encourage a shift from hard engineering to nature-based solutions.

5. Establishment of a coastal setback zone

Setback zones are used as an instrument in coastal zone planning in Mediterranean states that have ratified the Barcelona Convention's Protocol on Integrated Coastal Zone Management (ICZM). The establishment of these setback zones gives the coastline space to evolve naturally in response to meteorological and marine forcing, and can therefore serve as a proactive planning tool for climate change adaptation. If these no-build zones are combined with protective measures, the cost of future coastal flooding can be significantly reduced.

6. Reforestation of coastal zones

In 2018, UNEP and the FAO highlighted the climate-related risks for Mediterranean forest ecosystems. According to the 1st MedECC report (2020), global warming could double the burnt area by 2100 if no measures are taken.

Reforesting coastal forests or creating buffer zones with trees and shrubs will help protect inland areas from erosion and salinisation, while improving biodiversity. These green buffer zones stabilise the soil, absorb excess water and act as carbon sinks, which is beneficial for climate adaptation.

A joint UNEP, UNDRR and FAO Mediterranean Forest Initiative was launched in 2023 to reduce the risk of natural disasters, protect and restore critical forest ecosystems and promote adaptation.

By integrating agricultural practices such as agroforestry, promoting sustainable thinning and recognising the ecosystem services provided by forests, local communities can protect their environment while generating economic opportunities (Haffner-Sifakis, NbS Workshops, Tangier and Kotor, 2024).

7. Creation/conservation of Marine Protected Areas (MPAs)

MPAs protect biodiversity, improve fish stocks and reduce human pressures, making ecosystems more resilient to climate impacts. Healthy MPAs will therefore help maintain ecosystem resilience faced with the stresses of climate and environmental change.

Extending MPAs in the Mediterranean can reduce overfishing, protect habitats and maintain the biodiversity that supports sustainable livelihoods such as tourism and fisheries.

[1] To find out more about the conservation and restoration of seagrass meadows, please see the ARTEMIS project: https://artemis.interreg-euro-med.eu/

8. Implementation of responsible agriculture and fisheries

NbS in agriculture and fisheries can reduce pressures on coastal ecosystems and improve their resilience. For example, sustainable aquaculture practices reduce habitat degradation, and environmentally-friendly farming methods prevent run-off that can damage marine habitats. These practices align with EbA by preserving ecosystem services, such as nutrient cycling and biodiversity, which are essential for a resilient Mediterranean coastline.

9. Involvement of local communities in co-management

Local communities can play a crucial role in NbS for coastal adaptation. Community co-management helps ensure the sustainability of NbS by involving stakeholders in conservation and adaptive management efforts, thereby promoting resilience. In addition, traditional knowledge and local know-how, combined with modern ecological practices, can promote resilient, community-based coastal management.

2.2.2 How can NbS support biodiversity conservation?

NbS help restore degraded ecosystems such as forests, wetlands, grasslands and coastal habitats, which provide a refuge for diverse species. Restoring these habitats not only helps protect species from extinction, but also improves ecosystem services (e.g. pollination, water filtration, carbon sequestration) that directly benefit biodiversity. These services also contribute to the health and resilience of habitats, improving living conditions for flora and fauna.

Furthermore, NbS encourage the creation of wildlife corridors and green infrastructure, which improve the movement and migration of species across fragmented landscapes, thereby ensuring the connectivity of ecosystems. They can also incorporate natural control mechanisms for invasive species, ensuring that native biodiversity is maintained and supported.

2.2.3 How can NbS support water and food security?

Sustainable management and conservation of water resources

NbS can improve water retention by restoring wetlands, forests and flood plains, which store and slowly release water. This is particularly important in Mediterranean regions, such as Morocco, where water scarcity is a growing concern. These ecosystems help prevent flooding during heavy rainfall and drought during dry periods, ensuring more stable water availability.

Figure 6. Wastewater treatment and reuse: Boukhalef wastewater treatment plant, Morocco

Source: Amendis

Sustainable agriculture and food security

The use of NbS in agricultural systems, such as cover crops, agroforestry and organic farming, improves soil fertility, increases water retention and reduces the need for synthetic fertilisers and pesticides. These practices help strengthen agricultural resilience to climate variability and ensure food security.

Furthermore, by promoting diversified ecosystems, such as mixed crop-livestock systems, NbS can reduce vulnerability to climate-related crop failures and increase overall food production. What's more, NbS can help improve biodiversity, which is essential for sustainable agriculture. One example is the PPI OSCAN project, which contributes to the

promotion of good environmental and agricultural practices and the sustainable creation of environmental corridors around the Oued Tine in Tunisia.[2]

Figure 7. PPI OSCAN project to promote good environmental and agricultural practices in Tunisia

Table 1. Main benefits of NbS for EbA

Main benefits of NbS for EbA
• *Enhanced coastal protection*: by reducing coastal erosion, wave impacts and salinisation, NbS help protect communities and infrastructure. • *Biodiversity conservation*: NbS projects protect and restore habitats essential to local species, thereby supporting marine and coastal biodiversity. • *Carbon sequestration*: plant restoration projects, such as the rehabilitation of seagrass meadows and wetlands, promote carbon capture and storage, thereby mitigating greenhouse gas emissions. • *Socio-economic support*: NbS can boost local economies by improving fisheries, tourism and agriculture while providing sustainable jobs.

2.2.4 How can NbS inform Integrated Coastal Zone Management (ICZM)?

NbS offer valuable insights and strategies that can considerably improve Integrated Coastal Zone Management (ICZM) by proposing sustainable and resilient approaches to coastal challenges. In addition to the ecosystem services of protection from natural disasters, support for biodiversity and fisheries, and carbon sequestration, NbS encourage adaptive and flexible approaches that integrate ecosystem restoration and conservation into coastal planning. By using ecosystem approaches, ICZM can be better prepared for climate-induced changes, by adjusting policies and practices in line with changes to environmental conditions. NbS can promote adaptive monitoring frameworks that adjust management strategies to ecosystem responses in real time, making ICZM more resilient.

In addition, and as mentioned above, NbS often rely on community involvement and local knowledge, particularly in the restoration and management of natural coastal components. This fits in well with the inclusive approach of ICZM, which enhances local management and incorporates diverse interests.

By capitalising on NbS, Mediterranean coastal zones can strengthen their resilience to climate risks, improve water management, enhance food security and preserve biodiversity. These solutions create mutually-beneficial outcomes for ecosystems, the economy, culture and human communities (Table 2) (Karner, Tangier Workshop, 2024).

[2] For more information, visit the Plan Bleu report on NbS for Mediterranean cities here: https://planbleu.org/wp-content/uploads/2024/07/Plan-Bleu-NbS-in-Mediterranean-cities-report_Final.pdf

Table 2. Co-benefits of NbS

Social co-benefits	Economic co-benefits	Preservation of cultural heritage and traditions
Improvement of health and well-being through ecosystem services, such as air and water purification.	No need for major infrastructure investment → cost-effective solutions that are financially viable for small local communities.	Protect ancient monuments, archaeological sites and other important cultural heritage from climate hazards, such as flooding, landslides, storm surges and coastal erosion.
- Promote sound and inclusive governance through stakeholder participation. - Offer opportunities for equal participation to women, young people, indigenous peoples and local communities. This also reduces the risk of forced migration.	Preserve the livelihoods of local communities by preserving traditional trades (e.g. traditional farming, crafts, bee-keeping). Opportunities to diversify livelihoods through the emergence of new professional activities → e.g. eco-tourism, management of natural areas.	Preservation of the age-old traditions of Mediterranean peoples, such as terraced farming, transhumance and local cultures, some of which are recognised by UNESCO as global intangible cultural heritage.

2.3 HOW CAN NBS BE IMPLEMENTED AS PART OF A LANDSCAPE APPROACH, "FROM SOURCE TO SEA"?

Different climate-related risks may need to be managed at different spatial scales. For example, a risk of coastal erosion may need a solution to take into account the whole catchment area. It is also possible for a measure to affect neighbouring lands and environments. It therefore makes sense to adopt a broader perspective (a landscape perspective) in order to take into account all the effects of an NbS measure. This landscape approach emphasises the connectivity and interdependence of ecosystems and how activities in upstream areas can affect downstream coastal environments.

2.3.1 In coastal urban areas

In these kinds of contexts, NbS aim to build resilience, reduce vulnerability and improve quality of life, using the following strategies (Prem and Mansour, NbS Workshop, Tangier 2024):

1. Water management and flood resilience

- Rainwater management: implementation of green infrastructure such as rain gardens, permeable paving and green roofs to reduce surface run-off and manage water infiltration. These practices help control urban flooding and reduce pressure on conventional drainage systems.
- Restoration and creation of wetlands: wetlands in urban and peri-urban areas can act as natural buffers against flooding, by absorbing excess water during heavy rainfall and improving water quality through filtration processes.
- Restoration of watercourses and river buffer zones: the rehabilitation of watercourses and their flood plains in urban areas enables natural flood management and promotes biodiversity. River corridors (green space alongside bodies of water) provide natural habitats, improve water quality and create green spaces for communities.

2. Urban green spaces and biodiversity

- Green spaces such as parks, urban forests and community gardens provide recreational areas, improve air quality, reduce heat island effects and enhance biodiversity. These spaces also connect different parts of the urban landscape, providing ecosystem services such as carbon sequestration, cooling and habitat creation.
- Green corridors and connectivity: creating green corridors connecting urban areas to natural landscapes ensures the movement of species and maintains ecosystem functions. This can include urban trees, green walls and wildlife corridors, contributing to ecological resilience.

Figure 8. Tangier site before and after planting

(cf. Mansour (PAP/RAC), Taniger Workshop, 2024)

3. Protection of coastal towns and cities

- In the seas around coastal urban areas, restoring seagrass meadows, coral reefs and salt marshes can act as a buffer against storm surges and the sea level rise, and protect coastlines from erosion and coastal flooding, while providing an essential habitat for marine life.

4. Urban and peri-urban agriculture

- Promoting urban agriculture and agroforestry practices that integrate trees and crops to reduce the urban heat island effect, improving soil quality and supporting local economies.
- In peri-urban areas, the promotion of sustainable agricultural practices (such as soil conservation techniques) that preserve natural resources can help to reduce run-off and pollution that could flow into urban areas and coastal ecosystems.

5. Green infrastructure and urban resilience

- Ecological urbanism and design of sustainable cities: integrating NbS into the urban fabric, such as building with natural materials and designing neighbourhoods with integrated green spaces and biodiversity, can improve human health and enhance urban resilience to climate change, atmospheric pollution and extreme weather events.
- Urban wetlands as multifunctional spaces: urban wetlands can serve as both flood control systems and recreational areas, providing both ecological services and social benefits to communities.

6. Climate change adaptation and mitigation

- Integrating NbS into urban areas contributes both to local adaptation (by cooling and reducing flooding) and global mitigation targets (through carbon capture).
- Integrating NbS into urban infrastructure (such as planting trees for shade) can reduce energy consumption for cooling buildings, thereby reducing the urban carbon footprint.

2.3.2 In coastal hinterlands, farmland and rural areas

Implementing NbS in coastal hinterlands, farmland and rural areas involves strategies that harness natural processes and biodiversity to build resilience, restore ecosystems and improve livelihoods. Here's how NbS can be applied in these areas:

1. Catchment areas and rivers (upstream areas)

- Restore vegetation along rivers and streams to reduce erosion, improve water quality and increase biodiversity. These buffer zones filter nutrients and pollutants before they reach downstream environments.
- Planting trees in catchment areas helps stabilise soils, prevent sedimentation in rivers and maintain groundwater recharge, while agroforestry practices promote sustainable farming methods that reduce run-off and improve soil health.
- Build natural water retention systems such as ponds, wetlands and small dams to manage flooding, store water during periods of drought, and maintain downstream flows to coastal areas.

2. Farmland and rural areas (in-between regions)

- Implement agro-ecological practices to make farming systems more resilient to climate change.

- Use techniques such as terraces, grassed waterways and vegetation cover to prevent soil erosion, which can otherwise lead to sedimentation in rivers and estuaries.
- Promote rainwater harvesting and the use of water-efficient irrigation systems to reduce pressure on freshwater resources.

3. Downstream coastal areas

- Restoring dunes, beaches and coastal vegetation can help protect inland areas from extreme weather events, mitigate coastal erosion, and provide a habitat for wildlife.
- Establish MPAs, no-take zones or practices for sustainable fisheries management to protect marine biodiversity, restore fish populations and maintain healthy ecosystems.
- Restoration efforts in the coastal hinterland support marine food webs and enhance coastal resilience.
- Promoting a holistic approach that integrates ICZM with the protection of hinterland catchment areas can ensure the sustainability of the whole landscape, including wetlands and adjacent agricultural land.

2.4 STATUS OF NBS/EBA IMPLEMENTATION IN SCCF COUNTRIES

The status of implementation of Nature-based Solutions (NbS) and Ecosystem-based Adaptation (EbA) in SCCF countries shows promising initiatives in various Mediterranean regions, although their application on a wider scale remains a challenge. Although effective on a small scale, these solutions still need to be deployed consistently and systematically throughout the Mediterranean region.

- **Restoration of forest ecosystems and sustainable management:**

In several Mediterranean countries, initiatives have been introduced to restore forest ecosystems. For example, in areas such as Tunisia and Morocco, solutions such as agroforestry and sustainable pastureland management have been applied to strengthen the resilience of ecosystems in the face of forest fires and soil degradation. These local projects have yielded positive results, but their deployment on a regional scale remains limited by financial and organisational obstacles, as well as challenges associated with coordination between the various stakeholders involved.

Figure 9. Different phases of the National Reforestation Plan (NRP) in Lebanon

Source: UNDP.[3]

- **Coastal adaptation and protection of sensitive areas:**

Coastal adaptation is a key strategy in countries such as Lebanon, Greece and Montenegro, where NbS have been implemented to protect wetlands and dunes, along with the use of coastal vegetation to stabilise soils. For example, Kotor Bay in Montenegro has seen the integration of NbS to reduce the risks of flooding and erosion. These solutions provide an effective response to the challenges of rising sea levels and extreme weather conditions. However, although these initiatives have shown some progress, more needs to be done to integrate them into coastal planning on a Mediterranean scale. An example of good practice is the GEF/UNEP project “Strengthening the resilience of the Kune-Vaini lagoon through ecosystem-based adaptation (EbA)” in Albania. By continuing to share knowledge, the lessons learned from this project can be shared with other SCCF countries and beyond, to foster the resilience of these sensitive ecosystems.

3 For further information, visit: https://www.undp.org/lebanon/publications/safeguarding-and-restoring-lebanons-woodland-resources-technical-report

Figure 10. Adriatic Sea (left) and Kune-Vaini lagoon system (right), Albania

Source: UNEP official website.

- **Management of climate risks in agricultural and rural areas:**

Faced with frequent fires and soil degradation, the Tangier-Tetouan-Al Hoceima (TTA) region in Morocco has implemented solutions such as riparian forest management and sustainable agriculture. These practices aim to restore ecosystems, protect biodiversity and limit the impact of climate change. Particularly countries such as Morocco and Tunisia are applying these practices to combat soil degradation and strengthen the resilience of rural areas. However, extending these solutions on a regional scale requires greater coordination between governments and local communities.

- **Citizen science as a tool for environmental management:**

Citizen science projects, such as those in the Al Hoceima National Park in Morocco, involve local fishermen and citizens in waste management and water quality monitoring. These initiatives help improve environmental performance while supporting the local economy. At the same time, ecological restoration projects, such as seaweed and shellfish farming, are helping to regenerate marine ecosystems, increase no-take zones and reduce fishing efforts. In addition, the co-management programme between the Moroccan National Agency for Water and Forests (ANEF) and AGIR strengthens local and national cooperation for the management of protected areas and the conservation of natural resources.

Projects such as the ILIAD platform, the monitoring of conservation targets and species action plans, including for the osprey, apply solutions that draw on Ecosystem-based Adaptation (EbA) to reduce threats to species. Lastly, inclusive initiatives, such as the manufacture of biodegradable fish traps by local women, strengthen their role in the management of natural resources. These actions meet NbS criteria and need to be developed and integrated into national strategies to maximise their effectiveness.

- **Governance and coordination for the successful implementation of NbS:**

The implementation of NbS requires effective governance and cross-sector coordination. For the SCCF project, this was encouraged in Montenegro and Morocco by working with the local authorities, NGOs and community to integrate NbS in coastal risk management. In other regions, such as Lebanon and Bosnia-Herzegovina, the implementation of NbS is hampered by challenges relating to the coordination and fragmentation of policies. Strengthening governance mechanisms and promoting transnational cooperation will be key to maximising the benefits of NbS in the region.

In conclusion, Nature-based Solutions (NbS) and Ecosystem-based Adaptation (EbA) in SCCF countries have great potential to build resilience to climate challenges, restore ecosystems and support local economies. However, these solutions are often implemented on a local scale, which limits their regional scope. If they are to be fully effective on a wider scale, it is crucial to overcome the financial obstacles and strengthen coordination between the various stakeholders.

An essential success factor for these solutions is training in Ecosystem-based Adaptation (EbA). Without an in-depth understanding of ecological dynamics and how these systems can be managed sustainably, NbS cannot be properly applied. Appropriate training will maximise the impact of NbS, by effectively integrating them into national and regional public policies.

With increased support for coordination, funding and governance, and a focus on EbA training, NbS can become a key tool for fighting the impacts of climate change in the Mediterranean.

2.5 CASE STUDIES AND BEST PRACTICE IN NBS/EBA IN SCCF COUNTRIES

Nature-based Solutions (NbS) and **Ecosystem-based Adaptation (EbA)** are essential approaches for enhancing the resilience of ecosystems and coastal communities when faced with the impacts of climate change. These solutions are based on the restoration and sustainable management of ecosystems to reduce vulnerability to climate risks, while supporting biodiversity and food security.

Morocco case study: Tangier-Tetouan-Al Hoceima Region

The Tangier-Tetouan-Al Hoceima (TTA) region is particularly vulnerable to climate risks, such as rising sea levels, coastal erosion and flooding. Best practice in this region includes the restoration of dunes and wetlands. Techniques such as sand fences (dune protection systems) have been used to limit erosion and stabilise soil, alongside greening projects using local species. These actions are supported by rigorous ecological monitoring and the active involvement of local communities, who play a key role in the sustainable management of coastal areas. The establishment of coastal setback zones also promotes proactive risk management by giving nature the space it needs to adapt.

In this context, shellfish farming projects have been implemented in Cala Iris, supported by the National Aquaculture Development Agency (ANDA). These projects aim to purify and restore marine environments while increasing the income of local fishers. Shellfish farming, particularly mussels, contributes to the regeneration of marine ecosystems by filtering water and creating habitats for marine fauna. At the same time, these initiatives offer new economic opportunities for fishers by diversifying their activities.

Montenegro case study: Bay of Kotor

In Boy of Kotor, a UNESCO World Heritage site, a flagship example is the restoration of coastal wetlands in response to climate risks in the Tivatska solila special nature reserve in Montenegro.[4] These areas act as natural buffers, mitigating the impact of flooding and supporting marine biodiversity. The project has incorporated a participatory approach, involving local stakeholders in the management of these spaces, and has promoted the use of innovative technologies to monitor changes in the ecosystem. This approach is essential to understand the dynamics between humans and their environment in a region facing heavy demographic pressure.

Figure 11. Wetland restoration in the Tivatska solila special nature reserve

(Ivanovic, Kotor Workshop, 2024)

Shared methods and best practice

Successful projects in these regions share a number of common characteristics, which help to maximise their effectiveness:

1. **Participatory approach**: The inclusion of local communities and stakeholders in the design and implementation of NbS is crucial to ensuring the acceptance and sustainability of projects.
2. **Targeted ecological restoration**: Managing wetlands, protecting seagrass meadows and restoring dunes are effective strategies for enhancing the resilience of coastal ecosystems when faced with the impacts of climate change.
3. **Inclusive governance**: Creating cross-sector management committees helps involve various stakeholders (local authorities, private companies, etc.) to ensure the consistent and sustainable management of natural resources.
4. **Adaptive monitoring**: Modern technologies, such as sensors and drones, can be used to monitor ecological impacts in real time and adjust adaptation strategies on the basis of the data collected.

4 A video on wetland restoration in the Tivatska solila special reserve is available here: https://www.youtube.com/watch?v=EE1qiHmnO8U

Further examples from the Mediterranean

1. **Restoration of dunes in Perpignan, France**
   Perpignan Métropole Méditerranée has launched a dune restoration project to combat coastal erosion, enhance biodiversity and protect urban areas from coastal flooding. This project is part of the French government's call for projects "Nature-based Solutions to adapt coastal areas to erosion".
2. **Coral restoration in Toulon, France**
   In Toulon, the Ocean Quest France association is working to restore coral reefs in the Mediterranean. Using sustainable techniques, the team is identifying damaged colonies and replanting them to strengthen the resilience of the reefs to marine heat waves and other environmental stressors.
3. **Restoring wetlands in Tunisia**
   In Tunisia, projects have been implemented to restore coastal wetlands, with the aim of protecting biodiversity and mitigating the effects of rising sea levels. These initiatives preserve important habitats for migratory birds and enhance the resilience of local communities faced with the risks of flooding.
4. **RESCOM Programme in the Mediterranean**
   The RESCOM project, supported by the French Facility for Global Environment (FFEM), has adopted a multi-partner, multi-biome approach to enhancing the resilience of Mediterranean ecosystems. This programme implements Nature-based Solutions to restore and preserve biodiversity, while actively involving local communities in the sustainable management of natural resources.

Lessons learned and recommendations

The main lessons learned from these experiences include the importance of continuous training for local stakeholders, the use of innovative funding mechanisms, and the need for public policies favourable to the integration of NbS within national natural resource management strategies.

Recommendations for extending these practices to other Mediterranean countries include:

- **Local capacity building** in ecosystem management and environmental monitoring.
- **Encouraging public-private partnerships** to provide financial support for NbS projects.
- **Integrating NbS** into coastal zone management plans and national climate policies to ensure their long-term sustainability.

These initiatives clearly show that Nature-based Solutions are essential to enhancing the resilience of Mediterranean ecosystems and communities in the face of the challenges of climate change, while preserving biodiversity.

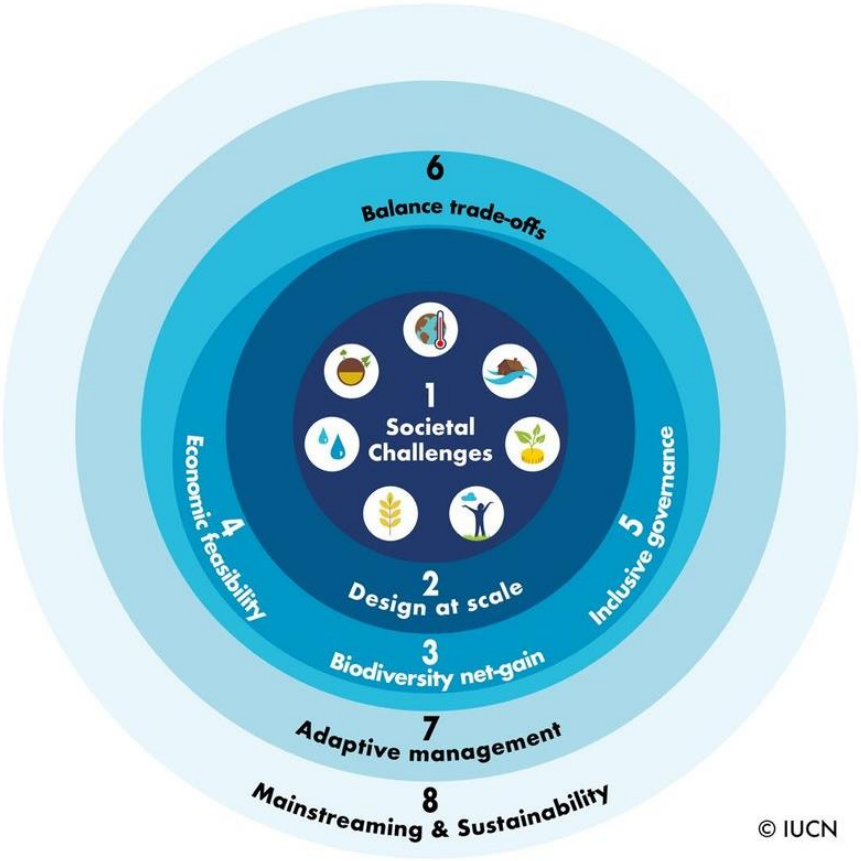
3 Structure of the training workshops

To enhance capacity building and create a network and communication platform in the Mediterranean for sharing knowledge on coastal adaptation, with a focus on NbS and EbA, two workshops were organised on 3 - 4 October 2024 in Kotor, Montenegro, and on 4 - 5 November 2024 in Tangier, Morocco.

The workshops began with a presentation of the current context and awareness-raising of the climate risks currently perceived in the project countries, particularly on the pilot sites. Studies, such as a gender-sensitive climate risk assessment in Kotor Bay, Montenegro,[5] and in the Tangier-Tetouan-Al Hoceima Region, Morocco,[6] were used to visualise vulnerabilities on the pilot sites.

The NbS and EbA concepts were then presented, along with important approaches and their links with these concepts, which are also summarised in Chapter 2 of this report. Presentations by experts always left space to connect international projects to the local concept presented previously, in order to ensure good knowledge sharing.

Figure 12. The eight criteria of the IUCN Global Standard for NbS



These presentations and discussions were followed by the training module on the eight criteria in the IUCN Global Standard for NbS. This training module aimed to structure group activities by transforming the criteria and indicators into practical questionnaires to guide participant discussions and analyses. The main objective of this activity was to help participants to understand NbS, explore their specific applications in Integrated Coastal Zone Management (ICZM), and define strategies adapted to the different Mediterranean contexts. The IUCN criteria served as a basis for discussion, assessment and the formulation of recommendations.

5 Gender-sensitive climate risk assessment of Kotor Bay, Montenegro (EN version)
6 Gender-sensitive climate risk assessment of the Tangier-Tetouan-Al Hoceima Region 2022 (EN version – FR version)

Figure 13. Regional Training on NbS and EbA in Tangier, 2024

3.1 PARTICIPATORY TRAINING MODULE

The methodology and structure of the participatory training for group activities are described below.

1. **Introduction to the NbS Tool and Criteria.** Before starting the group work, participants were introduced to a tool specially developed for this event, which includes the eight essential NbS criteria. The tool was designed to guide participants through a process of systematic analysis, while remaining adaptable to the local contexts of the different Mediterranean countries. The eight criteria are illustrated in Figure 12. Each criterion was defined with specific objectives and corresponding indicators to measure the success of NbS in the different regions.
2. **Transformation of criteria into a discussion questionnaire.** To facilitate discussion and enable practical assessment, each criterion was transformed into an interactive questionnaire. This process helped guide discussions by questioning participants on specific themes linked to each criterion and its indicators. Here's how the criteria were transformed into practical tools:

- **Criterion 1: Societal challenges.** The questions supported socio-economic diagnostics, by exploring local people's livelihoods, their specific needs and the challenges to be overcome in managing coastal resources. Participants were invited to reflect on how to ensure transparency and a better understanding of the social impacts of NbS.
- **Criterion 2: Design at scale.** Questions addressed the barriers to participation, particularly for marginalised groups, and the methods of inclusion needed to ensure participatory management of NbS. The aim was to ensure that all stakeholders had a voice, particularly local communities, in defining and implementing NbS projects.
- **Criterion 3: Biodiversity net-gain.** Questions were asked to identify indicators measuring the impact of NbS on local communities, particularly in terms of quality of life and biodiversity. Participants discussed how to adopt appropriate and effective monitoring systems.
- **Criterion 4: Economic feasibility.** Discussions focused on funding mechanisms, in particular access to public and private funding, and the importance of public-private partnerships for the viability of NbS projects.
- **Criterion 5: Inclusive governance.** The questions identified the challenges of cross-sector coordination (environment, health, economy) and proposed collaborative mechanisms for the integrated management of NbS.
- **Criterion 6: Balance trade-offs.** Participants were asked to consider the potential costs and benefits of NbS and to identify possible trade-offs for multiple use within a single zone.
- **Criterion 7: Adaptive management.** This criterion highlighted the importance of adaptive management, capable of adjusting according to feedback and the data collected, in order to guarantee the sustainability of NbS.
- **Criterion 8: Mainstreaming and sustainability.** Lastly, participants discussed the legislative and institutional frameworks needed to ensure the long-term sustainability of NbS and their mainstreaming into national and local policies.

3. **Distribution of tasks and working groups.** Given the large number of criteria and indicators to address, and the participation of over 70 experts from a variety of backgrounds, the workshop was organised through the careful distribution of tasks. The participants, each with their own unique expertise, were divided into groups according to their skills and experience, in order to promote everyone's expertise. This distribution encouraged more focused and relevant discussions, fed by diverse perspectives.

4. **Sharing results and shared reflection.** The focus groups were asked to interpret the local contexts in which the NbS would be implemented, based on the criteria and indicators defined. Each group explored local challenges and proposed concrete solutions, which were presented and discussed during plenary sessions. This process helped build shared reflection and a consensus on the best strategies for implementing NbS in the Mediterranean region.
5. **Summary of discussions and creation of recommendations.** The results of group discussions were summarised as concrete recommendations adapted to the contexts of participating Mediterranean countries. Each criterion helped identify specific actions and implementation strategies to meet the challenges identified. These recommendations have been included in this report, which will serve as a guide for the implementation of NbS in the Mediterranean region.

The workshop was designed as a forum for collaboration and collective reflection, with the aim of transforming the NbS criteria and indicators into concrete tools for action adapted to local realities. Using a participatory methodology, discussions were an opportunity for participants to analyse the specific challenges facing their countries, while promoting the integration of Nature-based Solutions in sustainable development strategies in the Mediterranean region.

The criteria-based **questionnaires**[7] gave a clear structure for discussions, which fed into an in-depth analysis of the social, economic and environmental aspects of NbS.

Figure 14. Regional Training on NbS and EbA in Kotor, 2024

Transforming the criteria into practical tools promoted a shared interpretation of the NbS objectives, ensuring that the actions proposed are not only relevant, but also feasible and adapted to local challenges. By dividing the tasks between more than 70 expert participants, each group was able to focus on a specific criterion, guaranteeing a detailed and enriching analysis.

Discussions during the workshop identified key recommendations for the implementation of NbS in the Mediterranean region, with particular emphasis on inclusive governance, adaptive monitoring and transparent processes. Participants stressed the importance of effective coordination between sectors, the active involvement of local communities and adequate financial support to ensure the long-term sustainability of NbS.

Key points include:

- **The need to establish continuous monitoring** of the impacts of NbS on communities and ecosystems, and to use the evidence to adjust projects in real time.
- **The creation of lasting public-private partnerships** to finance NbS projects and guarantee their longevity.
- **The integration of NbS within national and local public policies,** with particular emphasis on their legitimacy within existing legislative frameworks.

In conclusion, Nature-based Solutions are a key lever for improving the resilience of ecosystems and local communities in the face of climate challenges, but their implementation requires a collaborative approach, transparent governance and continuous adaptive management to maximise their impact.

7 A summarised version of the questionnaire, including the responses and recommendations developed during the workshop, is available in the appendix. For more information, please contact Plan Bleu.

4 Results

Presentations by experts and feedback from participants in the participatory training session have been compiled and summarised in this chapter to shed light on the gaps and barriers to the widespread adoption of NbS in SCCF countries, and the prerequisites and factors favourable to the implementation of NbS. These results feed into the recommendations presented in Chapter 6.

4.1 GAPS AND BARRIERS TO THE WIDESPREAD ADOPTION OF NBS IN SCCF COUNTRIES

Despite a considerable focus on the benefits of Nature-based Solutions, their integration into policy, planning and practice remains limited, due to political, societal and technical barriers and obstacles to their widespread adoption. Fully identifying and understanding these barriers is critical to the successful implementation of NbS (Sarabi et al., 2019; 2020).

4.1.1 Political and societal barriers

Institutional fragmentation and sectoral divisions

NbS generally involve a large number of sectors, stakeholders and policies. The many stakeholders, sometimes with overlapping responsibilities between sectors and different administrative levels, and "silo" approaches limit the scope for integrating innovative approaches into the planning and management of NbS.

Lack of long-term commitment

Adopting, implementing and maintaining NbS generally requires long-term planning, which conflicts with the short-term thinking of many municipal administrations and policymakers, who are more interested in projects that generate profit during their term of office. Even property developers and the private sector are often reluctant to take the risk of supporting and investing in projects with highly uncertain outcomes and possible financial losses.

Inadequate regulations

NbS are relatively recent innovative approaches, and the legislation supporting their implementation is not yet well established. While there are laws to protect the environment, biodiversity and Integrated Coastal Zone Management, these are dispersed and do not cover all the environmental and socio-ecological components of NbS. In general, current regulations have been developed on the basis of grey infrastructure and are unsuitable for NbS. In addition, a recurring problem, at least in Morocco, is that even when appropriate regulations exist, a lack of law enforcement can limit the adoption of solutions.

Insufficient financial resources

Local authorities are supposed to be responsible for implementing NbS, but generally have limited financial resources, which are allocated more to social spending and the development and maintenance of grey infrastructure. What's more, many of the benefits associated with NbS can only be achieved in the long term, whereas funding programmes are often for five years maximum. Insufficient financial resources can therefore be a real obstacle to the implementation of NbS. It is therefore crucial to better explore opportunities to attract private investment.

Lack of information and awareness for stakeholders

The Climagine participatory workshops revealed that stakeholders did not have the same level of knowledge, nor the same perception of coastal risks and the consequences of climate change on their coastline. Similarly, consultation with stakeholders at the NbS training workshops in Tangier revealed that most of them were insufficiently informed about the NbS standards and criteria defined by IUCN. Limited or sometimes even a total lack of awareness among stakeholders can hinder the process of developing NbS, which cannot be effective and sustainable without the support of all stakeholders, including the local population. Raising their awareness can change their behaviour and instil a sense of collective ownership and responsibility regarding the importance of NbS.

Lack of research and training programmes on NbS

Scientific knowledge and understanding of NbS approaches will determine the ability of decision-makers to assess, predict and take action to preserve biodiversity and ecosystem services in the face of increasing human activity and inevitable climate change.

It must be said that in-depth knowledge of NbS is still crucially lacking in universities and research institutes in SCCF countries. This gap can be a real barrier to the adoption of NbS.

4.1.2 Technical barriers

Uncertainties linked to the implementation process and the effectiveness of NbS

NbS are relatively new approaches, not yet fully understood in most SCCF countries. They deal with complex socio-ecological systems on a variety of spatial and temporal scales, meaning that they are characterised by multiple uncertainties. These can constitute a real obstacle limiting the adoption of NbS by decision-makers.

On the other hand, there are few concrete examples and hard evidence demonstrating the multiple benefits of NbS and their effectiveness over large spatial and temporal scales, which increases uncertainty about their performance (Sarabi et al., 2019).

Lack of guidelines for the design, maintenance and monitoring of NbS

How can NbS be successfully designed, implemented and monitored given all the associated uncertainties? The current lack of successful and inspiring examples could be overcome by developing design standards and guidelines for the maintenance and monitoring of NbS, adapted to local conditions in different contexts.

Lack of available land, and land ownership constraints

In general, most NbS require more space to deliver the expected benefits than conventional grey infrastructure approaches. While space is available in natural or semi-natural coastal areas, this is far from true in urban areas, where land is a scarce and expensive resource. This can restrict the development of NbS, which require suitable locations.

This obstacle can be exacerbated by land ownership constraints. For example, in the coastal area of the TTA region, diagnostics showed that the complex legal, economic, political and social dimensions of land ownership are undoubtedly the main obstacle currently preventing the controlled implementation of a policy to enhance and protect the coastline.

In summary, the main barriers to wider implementation of Nature-based Solutions are the difficulty in predicting their long-term effectiveness, the lack of standardised methods for assessing their effectiveness, and the lack of data to produce a cost-benefit analysis, particularly when compared with traditional engineering approaches.

4.2 PREREQUISITES AND FACTORS FAVOURABLE TO THE IMPLEMENTATION OF NBS

Effective implementation of NbS requires specific prerequisites and certain factors favourable to policies, governance, funding, knowledge and community engagement.

4.2.1 Political and societal factors

Cooperation and partnership between stakeholders

The cross-cutting nature of NbS requires multi-stakeholder collaboration and coordinated efforts between different sectors, such as agriculture, forestry, fisheries, water management and urban planning. This can be difficult, especially due to differences in understanding the scope of NbS and the implementation approach. Cooperation between all stakeholders helps develop a common understanding of NbS and their benefits. Widely accepted definitions, such as the standards and criteria developed by IUCN, were used at the NbS training workshop in Tangier.

Community engagement

Engaging communities in the design and implementation of NbS ensures that local knowledge, needs and cultural practices are taken into account. This improves the acceptance, effectiveness and long-term sustainability of NbS. Through educational campaigns, coastal communities can be made aware of the importance of NbS and the role they can play in implementing solutions, ranging from individual actions to collective planning.

Funding and incentives

The use of economic instruments and incentives can act as a catalyst for the adoption and implementation of NbS. For example, it can encourage stakeholders to choose an NbS as the alternative offering them the best value for money if the cost-benefit analysis is able to demonstrate the economic advantages of NbS compared with grey infrastructure. Another form of incentive can encourage landowners and private companies to adopt NbS practices through tax breaks or payments for ecosystem services.

Economic instruments can also take the form of subsidies or public-private partnerships, as well as innovative instruments to attract investment such as green bonds and carbon markets.

Knowledge and capacity building, and sharing best practice

An in-depth understanding of local ecosystems, their functions and their services is essential for designing appropriate solutions. Training stakeholders at different institutional levels, including citizens and professionals, is therefore one way of reducing uncertainty about the functionality of NbS. To achieve this, there must be better access to spatial, ecological and climate data and scientific research in order to provide solid evidence to demonstrate the effectiveness of NbS in different contexts, and for informed decision-making.

Capacity building is also recommended for NGOs so they can pass on reliable knowledge through educational activities in schools and public awareness campaigns. Informal education through newspapers, television, radio and the Internet can also facilitate the adoption of the NbS concept.

Another facilitating factor is sharing experiences and lessons learned between different contexts, through international networks and forums, using knowledge-sharing technologies. Technologies allow for the involvement of larger groups of stakeholders, and are quicker and cheaper than physical partnerships.

4.2.2 Technical factors

Assessment and monitoring of the NbS implementation process and their benefits

An effective monitoring and assessment system to monitor the progress of NbS implementation and assess the effectiveness of its operationalisation would be crucial in the event of revision or readjustment, given that NbS are long-term approaches and that environmental (including climate) and socio-economic conditions may change after implementation. These are key performance indicators for measuring progress, taking into account the spatial and temporal dynamics of NbS benefits.

A self-assessment tool has been developed by IUCN so that users of the Standard can calculate the score of their intervention in relation to the eight criteria and determine whether or not their intervention complies with the IUCN Global Standard for NbS (IUCN, 2020).

Optimising impact by combining NbS with grey infrastructure

In some cases, particularly in urban areas, hybrid solutions, which combine nature-based applications with grey techniques, can provide optimum impact, given the urgency, land requirements and expense involved. For example, protection against extreme flooding cannot be achieved solely by implementing NbS in most cases. An effective combination or integration of NbS and grey infrastructure can facilitate the acceptance of NbS, which offer additional benefits such as reducing the risk of pollution of downstream areas and supporting biodiversity.

Appropriate planning and design

To ensure that NbS are fully implemented, they must be appropriately designed. Their location and size must be planned in alignment with the coastal ecosystem. The aesthetics and expected benefits of these NbS are also essential to their successful adoption by the public. It is important to plan NbS on a landscape scale, using a “source to sea” approach, in order to assess their interaction with other landscape components (urban, agricultural or other natural ecosystems) and optimise the synergies and trade-offs between them. It is also important to ensure that NbS are designed within a long-term perspective, and that they are flexible and resilient to future changes.

In conclusion, the integration of these political, societal and technical factors can create a favourable environment for the implementation of NbS and maximise their social and environmental benefits. This especially includes identifying relevant political mechanisms and institutional reform levers in order to better allow for the development of NbS. However, further research is still needed to guide decision-makers and practitioners in the implementation of NbS, both for technical components and governance.

5 Recommendations

Given the many obstacles potentially associated with the adoption and implementation of NbS, it would be very useful to issue some strategic guidelines and recommendations to help policymakers, coastal managers, private companies and coastal communities to collectively embark on a green transition, through NbS, to better prepare for the impacts of climate change and enhance their resilience.

5.1 RECOMMENDATIONS FOR POLICYMAKERS

- Provide a favourable institutional framework, with cross-sector coordination and a holistic approach, which can greatly facilitate the provision of learning opportunities, and improve the way stakeholders view NbS.
- Ensure consistent, long-term political support and the alignment of national and local policies, which are essential to the successful implementation of NbS.
- Strengthen and update the legal arsenal. Regulatory provisions favourable to NbS are essential to reduce investment risks and encourage private stakeholders to adopt these solutions, especially through public-private partnerships.
- Explore new sources of funding and innovative economic models, such as payments for ecosystem services or public-private partnerships, to ensure the effective implementation of NbS.
- Integrate the value of ecosystem services in national accounting.
- Raise awareness among all stakeholders of the multiple benefits of NbS and their potential to build resilience in the face of crises, by developing generic documentation and platforms for learning and sharing experience and best practice.
- Invest in scientific research to promote evidence-based decision-making, and train experts capable of designing, implementing and assessing the effectiveness of NbS and developing solutions adapted to local contexts.
- Guarantee social justice by avoiding the marginalisation of vulnerable populations and including mechanisms for the fair distribution of the benefits generated by NbS. It is important to ensure that NbS projects do not reinforce social and economic inequalities.

5.2 RECOMMENDATIONS FOR COASTAL MANAGERS

NbS offer innovative approaches to coastal challenges such as erosion, flooding and the impacts of climate change. However, their implementation requires changing traditional approaches to coastal management. To this end, it is recommended to:

- Promote an integrated, ecosystem-based approach, and integrate NbS into national coastal plans. Managers need to work with biologists, engineers, town planners and local communities to ensure the success of NbS and maximise the long-term benefits.
- Plan for the long term, taking into account climate change and demographic developments, and design flexible solutions based on feedback and ecosystem monitoring.
- Explore various sources of funding, including public, private and international funds, and mobilise initial investment for the implementation of the NbS.
- Revise coastal land-use plans to include, where possible, natural buffer zones and ecological corridors.
- Compare conventional grey measures with the green techniques of NbS, in order to understand the differences and additional benefits of combining them in certain cases.
- Integrate local and traditional knowledge, and involve indigenous populations, whose traditional knowledge can supplement modern scientific approaches, to ensure the relevance and effectiveness of NbS, as well as their social acceptability.
- The scientific and technical complexity of implementing and monitoring the performance of NbS, especially in the face of the combined impacts of climate and human activities, requires interdisciplinary expertise and continuous cross-sector consultation to avoid potential conflicts.
- Focus on awareness-raising and the education of coastal communities and local elected representatives, and include all stakeholders in all stages of NbS projects.
- Promote co-creation, which can serve as a platform for capacity building, where stakeholders can learn from one other, share knowledge and develop new skills.

In conclusion, NbS offer coastal managers an opportunity to respond to climate and ecological challenges in a sustainable way. However, their adoption requires changes to traditional practices, better governance and a collaborative approach to maximise their benefits.

5.3 RECOMMENDATIONS FOR THE PRIVATE SECTOR

NbS are a fast-growing field, offering many economic and innovation opportunities for private companies. They can create new markets for products and services, such as ones linked to the restoration of ecosystems, regenerative agriculture or the energy transition. Recommendations include:

- Integrate NbS into development strategies by investing in natural assets such as blue carbon, agroforestry or green infrastructure projects.
- Invest in urban forests or wetlands to reduce the risk of flooding.
- Support projects to restore degraded dunes or seagrass meadows to protect coastal infrastructure.
- Encourage eco-innovation and the development of sustainable technologies, such as green urban planning and water management.
- Promote regenerative agriculture by adopting practices that improve soil health and increase its carbon sequestration capacity.
- Improve the energy efficiency of buildings and reduce urban heat islands by capitalising on green roofs and walls.
- Measure return on investment by integrating the environmental benefits (CO_2 capture, water conservation, etc.) and the savings generated (reduction in climate-related damage).
- Use robust indicators, monitoring metrics such as restored biodiversity, reduced emissions, and benefits for local communities.
- Work with NGOs and local experts who can provide technical expertise and ensure community support.
- Raise awareness and communicate through training and workshops, by integrating NbS into the corporate culture.
- Communicate the positive impacts by publicising the benefits of NbS in order to enhance their reputation and meet the growing expectations of communities.
- Take into account the needs of local populations to ensure the social acceptance and sustainability of projects.

By adopting these recommendations, companies can not only reduce their negative impact on the environment, but also improve their resilience in the face of climate and economic challenges.

5.4 RECOMMENDATIONS FOR CIVIL SOCIETY

Specific recommendations for civil society to promote and implement NbS could be as follows:

Awareness-raising and advocacy:

- Promote NbS by informing local communities, policymakers and other stakeholders about the ecological, economic and social benefits of NbS.
- Organise workshops, seminars and communication campaigns to raise awareness of the impacts of NbS on climate issues, biodiversity and food security.
- Influence public policies by lobbying governments to integrate NbS into development plans, climate change adaptation policies and environmental budgets.

Community mobilisation and engagement

- Work with local communities to co-design, implement and manage NbS projects to ensure their sustainability and relevance.
- Promote local capacity building by providing technical training in ecosystem restoration, agroforestry, sustainable forest management and other NbS practices.
- Encourage participatory governance and support collaborative models of natural resource management to ensure fair and inclusive management.

Working with partners

- Work with academic institutions to assess the effectiveness of NbS and strengthen their scientific base.
- Make private companies aware of the potential of NbS to generate economic benefits and encourage investment in these approaches.
- Support local organisations working in the field of NbS, by providing them with technical or financial support.

Funding

- Support micro-financing projects so that communities can launch and manage small-scale NbS initiatives.

Monitoring, assessment and learning

- Regularly assess the effectiveness of NbS initiatives to ensure their alignment with environmental and social objectives.

- Share any lessons learned and disseminate the successes and challenges encountered in implementing NbS projects in order to inspire others.
- Adjust strategies according to feedback and contextual changes.

By playing an active role in promoting and implementing Nature-based Solutions, civil society can be a key driver for a resilient ecological transition.

Conclusion

Nature-based solutions (NbS) are an integrated and innovative approach to meeting the environmental, socio-economic and climate challenges that especially affect Mediterranean coastal areas. These solutions use natural processes and biodiversity to enhance the resilience of ecosystems and human communities, by reducing their vulnerability to the impacts of climate change. Unlike purely technological solutions or solutions based on hard infrastructure, NbS offer a sustainable alternative that is more cost-effective and beneficial in the long term for the preservation of ecosystems and the development of local communities. However, to maximise their benefits, large-scale implementation requires inclusive governance, appropriate financial resources and increased awareness among local populations of the considerable advantages that these solutions bring.

Despite their great potential, the success of NbS depends on careful strategic planning and the ability to overcome various institutional, political and economic obstacles. Decision-makers must understand the importance of a systemic and inclusive approach that involves all relevant stakeholders, including governments, the private sector, civil society and local communities. This approach must include a fundamental paradigm shift, whereby nature is considered not simply as a pool of resources to protect, but as a strategic ally for meeting the environmental, socio-economic and climate challenges of the 21st century. To maximise the impact of NbS, coastal managers need to reconsider traditional management practices and adopt new forms of governance that enable cross-sector collaboration and shared decision-making, in order to enhance the sustainability and resilience of the solutions put in place.

One of the most effective approaches for maximising the benefits of NbS in Mediterranean coastal areas is the “source to sea” approach. This involves the integrated management of ecosystems from catchment areas to coastal and marine zones. This approach helps strengthen the resilience and sustainability of landscapes by integrating rural and agricultural areas into coastal zone management strategies. In this respect, Nature-based Solutions optimise ecosystem services right across the landscape, by preserving natural functions such as water infiltration, flood regulation and natural drainage. This means rethinking urban planning by integrating it with environmental management to ensure that the ecological benefits of nature are maximised in all water catchment areas. By adopting a consistent and integrated landscape approach, the actions taken in one area will contribute positively to the health of coastal and marine ecosystems downstream, creating a virtuous circle of improved environmental quality.

For NbS to be fully effective, it is also essential to encourage close collaboration between the private sector, governments and civil society. The private sector, in particular, has a key role to play in integrating sustainable practices into their development strategies, so that they can not only contribute to environmental protection, but also strengthen their resilience and competitiveness over the long term. For example, companies can play an important role in investing in green infrastructure projects that contribute to the restoration of ecosystems while providing an economic return.

Civil society, for its part, can be a key driver in promoting this ecological and resilient transition. Through local associations, community groups and non-governmental organisations, it can contribute to awareness-raising on environmental issues, encourage the adoption of NbS and play an active role in the management of natural resources. Community projects, such as dune restoration, sustainable forest management or shellfish farming, like the initiatives in the Mediterranean, show that the strong involvement of civil society can transform coastal zones into models of resilience in the face of climate impacts, while generating sustainable income for local communities.

Ultimately, integrating NbS into coastal management is an opportunity to build Mediterranean coastlines that are not only resilient in the face of climate challenges, but also benefit local ecosystems and communities. These solutions not only help fight against the impact of climate change, but also preserve and enhance the natural and cultural heritage of Mediterranean coastal regions. The successful implementation of NbS therefore represents a promising path towards sustainable and inclusive development for future generations, while ensuring the preservation of natural resources and promoting the ecological transition.

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Appendix

FULL REPORT ON THE GROUP WORK AND DISCUSSIONS OF THE EIGHT CRITERIA FOR IMPLEMENTING NATURE-BASED SOLUTIONS (NBS)

Criterion 1: Societal challenges

Objective: Promote a better understanding of the socio-economic characteristics of local communities in order to design NbS projects that meet the real needs of these populations, while respecting transparency with stakeholders. This approach ensures that NbS projects are rooted in local realities and maximise their positive social impact.

Discussion questions:

- How can we better understand the economic activities and livelihoods of local communities?
- What mechanisms should be put in place to guarantee transparency in data collection and communication?

Responses:

- **Detailed socio-economic diagnostics:** In-depth diagnostics must include key economic sectors (agriculture, fisheries, tourism) along with cultural and social aspects that influence natural resource management practices. This will mean that NbS projects can be tailored to the specific needs of local communities and will help identify any potential impacts on their well-being.
- **Commitment and transparency:** It is crucial to establish regular and transparent participatory consultation processes with local communities. This will promote trust and the acceptance of NbS projects, particularly when there are changes in access to natural resources, such as fishing zones.
- **Examples of best practice:** Past projects in the Mediterranean region have shown that socio-economic diagnostics carried out with the participation of communities makes it possible to tailor solutions to real needs, thereby increasing the effectiveness of NbS initiatives.
- **Challenges:** Collecting precise socio-economic data is complicated by limited resources and a lack of suitable tools. Communication problems between local institutions and communities also create barriers to transparency.

Recommendations:

- Set up dedicated field teams to complete participatory socio-economic diagnostics.
- Create a centralised digital platform to promote transparency of information between all stakeholders.
- Train local staff in the use of suitable tools and methods to improve the collection of socio-economic data.

Criterion 2: Design at scale

Objective: Ensure that all segments of society, particularly marginalised groups, are actively involved in the design and implementation of NbS projects. This will not only strengthen the legitimacy of projects but also promote fairness and social justice.

Discussion questions:

- How can we ensure that marginalised groups are included in decision-making processes?
- What are the barriers to effective participation and how can they be overcome?

Responses:

- **Awareness-raising and education:** Targeted awareness-raising is needed, particularly in rural communities where knowledge of NbS may be limited. Adapting education to different levels of understanding is essential for greater inclusiveness.
- **Digital adaptation and literacy:** Low levels of digital literacy in rural areas are a major obstacle. To overcome this barrier, there needs to be digital skills training so that local people can participate effectively in projects.
- **Strengthening the financial culture:** The management of NbS projects by local cooperatives is often hampered by a lack of financial culture. It is therefore essential to strengthen local financial management so that communities can manage projects autonomously, thereby ensuring their long-term sustainability.
- **Challenges:** Different levels of education, cultural barriers and unequal access to technology make it difficult to include all stakeholders. The digital divide is particularly marked in rural areas, hindering the participation of local communities.

Recommendations:

- Develop training programmes in digital literacy and financial culture for rural populations and cooperatives.
- Create visual and simplified communication formats to make NbS concepts accessible to everyone.
- Involve community leaders in awareness-raising efforts to strengthen local participation and ensure community support for NbS projects.

Criterion 3: Biodiversity net-gain

Objective: Establish rigorous, evidence-based monitoring systems to assess the impact of NbS on the well-being of local populations and the resilience of ecosystems. This approach means that projects can be adjusted according to the results obtained, ensuring their long-term effectiveness.

Discussion questions:

- What indicators should be used to assess the well-being of local communities?
- How can the ecological impact of NbS projects be assessed?

Responses:

- **Quality-of-life indicators:** Indicators such as air quality, food security, public health and access to natural resources need to be monitored. These measurements will be used to assess whether NbS are helping to improve the living conditions of local communities in a tangible and measurable way.
- **Ecological monitoring:** The ecological impacts of NbS must be monitored using biodiversity indicators, such as the health of seagrass meadows, the population of target species and water quality. The use of advanced technologies such as sensors, drones and satellites will help monitor these ecological impacts in real time.
- **Perception of local communities:** Assessing the perception of local communities is essential to understanding their level of commitment to NbS and adjusting communication and management strategies in line with the feedback obtained.
- **Challenges:** Collecting continuous, accurate data is costly and requires human and material resources. What's more, financial and technical difficulties can hamper the implementation of effective monitoring.

Recommendations:

- Use cutting-edge technologies, such as sensors and drones, for precise ecological monitoring.
- Create a regular reporting system, involving local communities in the monitoring process, in order to collect their feedback and adjust interventions accordingly.
- Allocate specific resources to training local stakeholders in ecological and social monitoring methodologies.

Criterion 4: Economic feasibility

Objective: Facilitate access to funding and encourage partnerships to ensure the long-term financial viability of NbS projects.

Discussion questions:

- What financial mechanisms are available to support NbS in the region?
- How can the private sector be encouraged to invest in NbS?

Responses:

- **Dedicated NbS funds:** Establishing a special NbS fund will ensure ongoing, targeted funding for local projects. This fund could be financed by public and private resources, and tax incentives.
- **Encouraging the private sector:** Reward mechanisms or tax incentives could be introduced to encourage the private sector to invest in conservation and NbS initiatives.
- **Public-private partnerships:** Partnerships between the public and private sectors need to be encouraged in order to guarantee sustainable funding for NbS projects, share costs and maximise project benefits.

Recommendations:

- Simplify funding access procedures for local projects.
- Introduce financial incentives to attract private investment in NbS.
- Create special subsidies for cooperatives and small local businesses that adopt NbS practices.

Criterion 5: Inclusive governance

Objective: Strengthen coordination between sectors and levels of governance to ensure the effectiveness of NbS projects. Integrated cross-sector management is essential to avoid duplication and to maximise synergies between the different economic and social sectors.

Discussion questions:

- How can coordination between sectors (environment, economy, health) be improved to ensure integrated management of NbS?
- What mechanisms can be put in place to facilitate collaboration between local and regional authorities?

Responses:

- **Cross-sector coordination:** NbS projects require close collaboration between sectors including the environment, health, economic development and other sectors. The creation of cross-sector coordination committees will strengthen cooperation and optimise the use of available resources.
- **Alignment of local and national strategies:** Local policies must be aligned with national strategies in order to avoid conflicting objectives and to guarantee the consistency of actions undertaken at regional and national level.
- **Data sharing and transparency:** Digital data sharing platforms must be introduced to ensure informed and consistent decision-making, involving all stakeholders.
- **Challenges:** The fragmentation of public policies and the lack of communication between the different local and national authorities can hamper the effective implementation of NbS.

Recommendations:

- Create cross-sector coordination committees to supervise and assess NbS projects.
- Establish data sharing protocols between local, regional and national institutions to facilitate informed decision-making.
- Encourage collaborative governance initiatives to harmonise conservation and sustainable development goals in NbS.

Criterion 6: Balance trade-offs

Objective: Strike a balance between the main objectives of NbS and the trade-offs they lead to in the region, and assess the processes implemented to constantly monitor and adapt NbS interventions. Promote technological innovation and research to improve the effectiveness and long-term impact of NbS.

Discussion questions:

- How can innovation be integrated into NbS projects?
- What areas of research are needed to improve the effectiveness of NbS?

Responses:

- **Advanced technologies and AI:** Using advanced technologies such as Artificial Intelligence (AI) makes it possible to analyse large quantities of environmental data, predict trends and improve the effectiveness of NbS.
- **Long-term research programmes:** Long-term research helps us to understand the impact of NbS on ecosystems on a broader scale, thereby ensuring more sustainable and appropriate management of natural resources.
- **Collaboration with academic institutions:** Collaboration with universities and research centres lets us benefit from scientific expertise and helps improve methodologies for implementing NbS.

Recommendations:

- Allocate specific funds for research and innovation in NbS.
- Work with local universities to develop applied research projects.
- Promote the use of new technologies in NbS monitoring and assessment methodologies.

Criterion 7: Adaptive management

Objective: Adopt adaptive management of NbS, based on evidence and continuous feedback, to adjust interventions in real time and strengthen their resilience to change.

Discussion questions:

- What strategy should be adopted for the monitoring and assessment of NbS interventions?
- How can the information collected be used to adjust NbS strategies in real time?
- What are the mechanisms for effective adaptive management in the implementation of NbS?

Responses:

- **Monitoring and assessment strategy:** A rigorous monitoring and assessment strategy is essential for the adaptive management of NbS. Monitoring criteria must be defined in advance to assess the impacts of NbS on ecosystems and human well-being, using clear and measurable indicators.
- **Iterative learning:** Adaptive management relies on iterative learning based on the outcomes of monitoring and assessment. This means regularly reviewing interventions, identifying gaps between the objectives and results, and adjusting strategies in response to new information and contexts.
- **Involvement of local communities:** Incorporating feedback from local communities into the monitoring process means that interventions can be adjusted in line with local needs and observations on the ground. Continuous feedback from beneficiaries ensures that projects remain relevant and effective.
- **Challenges:** Establishing an adaptive management system requires the continuous collection of quality data, which can be costly and technically complex. In addition, a lack of human and financial resources to monitor long-term projects can hamper the effectiveness of the adaptive process.

Recommendations:

- Develop a flexible monitoring and assessment plan, in order to make regular adjustments to projects according to the results obtained.
- Use advanced data collection tools (sensors, drones, AI) for real-time ecological and social monitoring.
- Train local stakeholders in monitoring methodologies and the use of new technologies to guarantee the quality of the data collected.

Criterion 8: Mainstreaming and sustainability

Objective: Ensure that NbS have long-term sustainability, are well integrated into national and local policies, and sit within an appropriate legislative and institutional framework to guarantee their continuity.

Discussion questions:

- How can we guarantee that NbS are integrated into national and local policies?
- What mechanisms need to be put in place to ensure the long-term sustainability of NbS?

Responses:

- **Integration into national and local policies:** NbS must be integrated into national and local strategies for natural resource management, sustainable development policies and biodiversity conservation plans. Decision-makers need to be made aware of the long-term benefits of NbS so that they can be integrated into political priorities.
- **Strengthening legislative frameworks:** To ensure the sustainability of NbS, a clear legislative framework needs to be developed that recognises NbS as effective solutions for conservation and climate change adaptation. This legislative framework should include mechanisms to ensure the continuity of NbS projects, including tax incentives and financial support.
- **Public-private partnerships:** Encouraging partnerships between the public and private sectors will help secure sustainable funding for NbS. These kinds of partnerships can also encourage the involvement of local businesses in the management of NbS, and ensure their continuity beyond the life of the projects.
- **Challenges:** The lack of a clear legislative framework to support NbS and insufficient long-term funding can threaten the sustainability of these projects. NbS must therefore be systematically integrated into natural resource management plans at all levels.

Recommendations:

- Raise awareness among policymakers of the importance of NbS by integrating these solutions into national strategies for natural resource management and biodiversity conservation.
- Promote financial incentives to encourage businesses and communities to adopt NbS as a conservation and climate change adaptation practice.
- Create legislative mechanisms to ensure that NbS receive ongoing support through public and private funding.