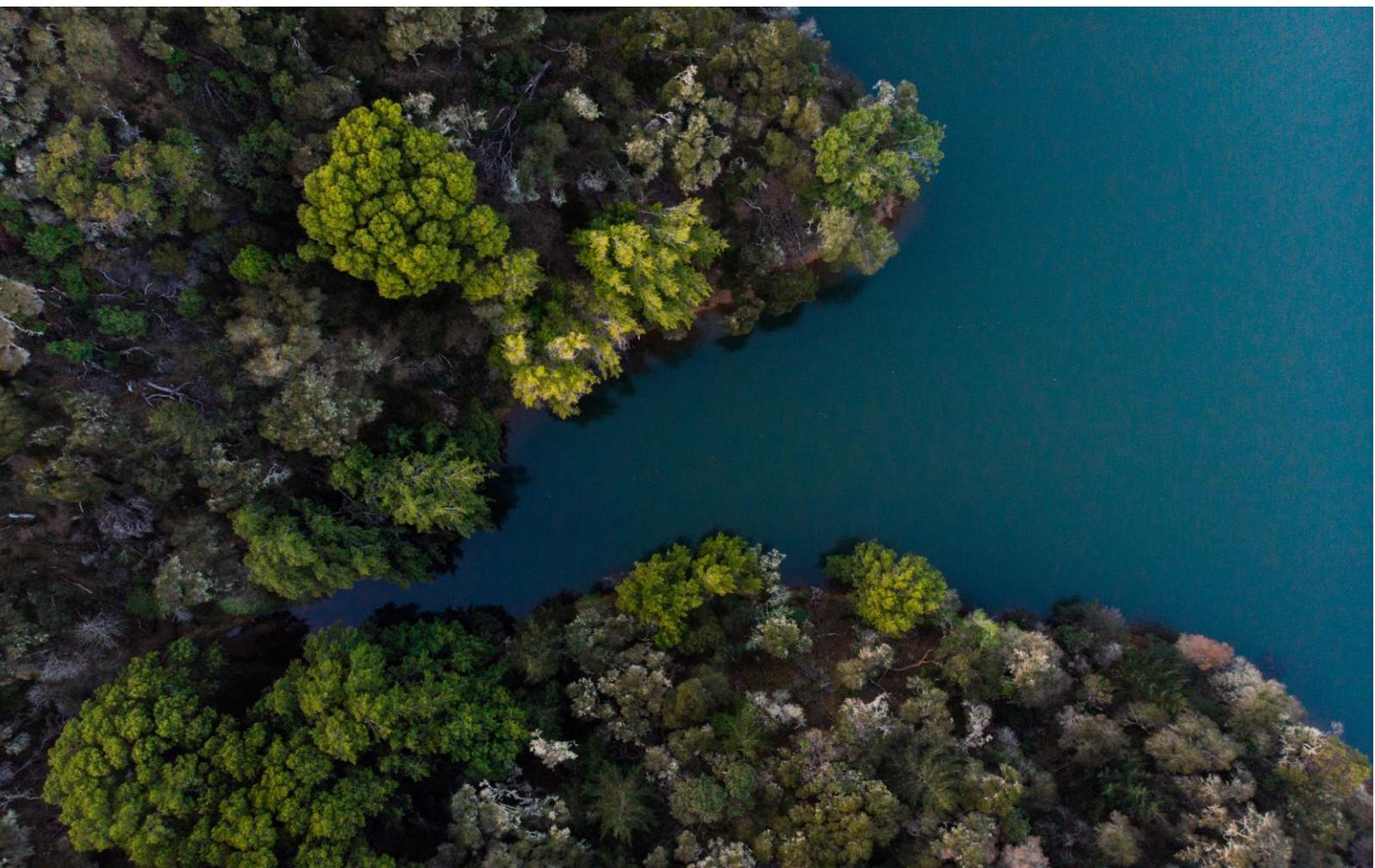




Prototype database of international Nature-based Solutions case studies

Supplementary report to the CCICED special policy study on value assessment of Nature-based Solutions

Kristin Meyer and Daisy Hessenberger



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IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs of Denmark; Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

This publication has been made possible in part by funding from the China Council for International Cooperation on Environment and Development (CCICED).

Published by: IUCN, Gland, Switzerland

Produced by: IUCN Centre for Society and Governance – Environmental Law Team

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Recommended citation: Meyer, K., and Hessenberger, D. (2022). *Prototype database of international Nature-based Solutions case studies: supplementary report to the CCICED special policy study on value assessment of Nature-based Solutions*. Gland, Switzerland: IUCN.

The main report is available here: China Council for International Cooperation on Environment and Development (CCICED) (2022). *Special Policy Study: Value Assessment of Nature-based Solutions*. CCICED Special Policy Study Report. Beijing, China: CCICED <https://cciced.eco/research/special-policy-study/sps-2-value-assessment-of-nature-based-solutions/>

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Contents

Abstract	I
Acknowledgments	II
Acronyms	III
List of figures	IV
List of tables	IV
1 Introduction	1
2 Methodology	4
2.1 Documentation framework	4
2.2 Case study selection and documentation	5
3 International case studies	6
3.1 Medmerry managed coastal realignment	7
3.2 Flood-based agriculture in the upper Mekong delta floodplain	11
3.3 Maristanis integrated coastal and wetlands management	17
3.4 Sustainable aquaculture and innovative seaweed farming in Zanzibar	20
4 Summary of results	25
References	26

Abstract

English

Nature-based Solutions (NbS) have gained increasing importance in tackling modern societal challenges. Case studies can be a useful tool to illustrate the value of NbS interventions. They demonstrate the elements that are essential for the successful design, implementation, monitoring and evaluation of NbS and thus enable learning from experiences in different contexts. The IUCN Global Standard for Nature-based Solutions™ is particularly suited to document the positive contributions of NbS. Based on its science-based and widely consulted criteria and indicators, the Standard helps verify NbS applications and promotes comparability as well as a coherent and consistent framework for benchmarking interventions. This supplementary report to the *CCICED Special Policy Study: Value Assessment of Nature-based Solutions* describes the methodology for the establishment of a prototype database of cases, presents selected international case studies that have been analysed in accordance with the agreed prototype documentation framework and offers lessons learned that support NbS uptake and implementation going forward.

Chinese

基于自然的解决方案（NbS）在应对现代社会挑战方面的重要性日益增加。作为一个实用工具，案例研究可用以辅助证明 NbS 的价值。NbS 案例可以展示其成功设计、实施、监测和评估所必需的要素，从而使人们能够从不同的情境中学习经验。世界自然保护联盟（IUCN）发布的《基于自然的解决方案全球标准》特别适用于记录 NbS 的积极贡献，该标准和其中的指标以科学为基础并经过广泛的征求意见，有助于验证 NbS 的应用，促进可比性，并为干预措施提供一个连贯一致的框架。本报告为 CCICED 特别政策研究报告《基于自然的解决方案的价值评估》的补充，报告描述了建立案例原型数据库的方法，介绍了基于拟定原型文件框架的部分国际案例分析研究，并提供了后续应用并实施 NbS 项目的经验与教训。

Acknowledgments

We wish to extend our gratitude to the China Council for International Cooperation on Environment and Development (CCICED) for establishing and supporting the Special Policy Study on Value Assessment of Nature-based Solutions, providing a platform for Chinese and international experts to discuss and exchange together. We are grateful to CCICED for providing the funds to carry out this work. Our special thanks go to the Special Policy Study Members, including the co-chairs, Mr. Bruno Oberle, CCICED Member and Director General of the International Union for Conservation of Nature, and Mr. Ouyang Zhiyun, Director-General of the Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, the Chinese and international teams as well as the team of Chinese and international advisors.

We would also like to thank the owners of the international case studies for providing information and reviewing drafts: Agroforestry systems for sustainable cocoa farming in the Lachuá Ecoregion - Tania Ammour, Guillermo Putzeys (IUCN) and the IUCN Regional Office for Mexico, Central America and the Caribbean; Medmerry managed coastal realignment - Nick Gray (Environment Agency of the United Kingdom); Flood-based agriculture in the upper Mekong delta floodplain - Andrew Wyatt (IUCN); Maristanis integrated coastal and wetlands management - Francesca Frau, Francesca Etzi and Vania Stazu (MEDSEA Foundation), Francesca Antonelli, Alessandra Pome', Emmanuelle Cohen-Shacham (SCP/RAC expert contribution), Alessandro Miraglia and Magali Outters (SCP/RAC supervision and coordination), Lourdes Lazaro Marin (IUCN); and Sustainable aquaculture and innovative seaweed farming in Zanzibar - Raphaëla le Gouvello (IUCN AquaCoCo Team), Aurélie Spadone (IUCN). A special thank you to Scott Perkin (IUCN) and Baolong Han (Chinese Academy of Sciences) for ensuring smooth coordination throughout the report preparation process and reviewing earlier drafts.

In addition, we wish to thank Sarina van der Ploeg, IUCN Publications Officer, and Huaqing Tang, CCICED, for their support and guidance in the editing and publishing process.

Acronyms

CBD	Convention on Biological Diversity
CCICED	China Council for International Cooperation on Environment and Development
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
ICRSL	World Bank Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project
ICZM	Integrated Coastal Zone Management
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ISEAL	International Social and Environmental Accreditation and Labeling
IUCN	International Union for Conservation of Nature and Natural Resources
NbS	Nature-based Solutions
SDGs	Sustainable Development Goals
UNEA	United Nations Environmental Assembly
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar

List of figures

Figure 1: Nature-based Solutions to address societal challenges. The seven societal challenges indicators are climate change adaptation and mitigation, disaster risk reduction, economic and social development, human health, food security, water security and environmental degradation and biodiversity loss. (© IUCN).....	1
Figure 2: The eight criteria of the IUCN Global Standard for Nature-based Solutions™ (© IUCN)....	2
Figure 3: Workflow for the development of the documentation framework of case studies (Source: Figure developed by the authors of this report).....	5
Figure 4: Workflow for the selection and documentation of case studies (Source: Figure developed by the authors of this report).....	5
Figure 5: Aerial view of the intervention area taken in September 2013 (© Environment Agency of the United Kingdom).....	7
Figure 6: Flood-based farming practiced by the local community in the Mekong delta (© IUCN)....	12
Figure 7: Area archeologica di tharros, San Giovanni di Sinis, Cabras, Italy (© Léonard Cotte, Unsplash).....	17
Figure 8: Women working in seaweed farms in Pemba, Zantibar (© R. le Gouvello).....	21

List of tables

Table 1: Summary of international cases.....	6
Table 2: Characteristics and benefits of the Medmerry managed coastal realignment based on the criteria of the IUCN Global Standard for Nature-based Solutions™.....	8
Table 3: Characteristics and benefits of flood-based agriculture in the upper Mekong delta floodplain based on the criteria of the IUCN Global Standard for Nature-based Solutions™.....	12
Table 4: Characteristics and benefits of the Maristanis integrated coastal and wetlands management based on the criteria of the IUCN Global Standard for Nature-based Solutions™.....	18
Table 5: Characteristics and benefits of sustainable aquaculture and innovative seaweed farming in Zanzibar based on the criteria of the IUCN Global Standard for Nature-based Solutions™.....	21

Prototype database of international Nature-based Solutions case studies

1 Introduction

Nature-based Solutions (NbS) are “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.”¹ The ongoing paradigm shift in the conservation community that led to the adoption of the Ecosystem Approach enshrined in the Convention on Biological Diversity (CBD) has evolved into a deeper understanding of the interlinkages between society and nature. NbS emerged from this deeper understanding as a way to operationalise the Ecosystem Approach, with the primary goal of applying conservation approaches to safeguard society (see Figure 1).^[1, 2, 3]



Figure 1: Nature-based Solutions to address societal challenges. The seven societal challenges indicators are climate change adaptation and mitigation, disaster risk reduction, economic and social development, human health, food security, water security and environmental degradation and biodiversity loss. (© IUCN)

More recently, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem

¹ This IUCN definition was endorsed by IUCN's 1,400 members at the 2016 World Conservation Congress in [Resolution 069](#); an expanded definition was recently adopted at UNEA-5.2 in the resolution entitled [Nature-based Solutions for supporting sustainable development](#)

Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC) recognised NbS and their role in climate change mitigation and adaptation, biodiversity protection and contributions to people.^[4] Moreover, the United Nations Environment Assembly (UNEA), held in Nairobi in the first quarter of 2022, adopted a resolution on Nature-based Solutions for Supporting Sustainable Development.^[5]

An assessment of NbS requires a consistent and common framework that helps document the positive contributions of NbS to green economic development, ecosystem management, climate change and other societally desirable outcomes. The IUCN Global Standard for Nature-based Solutions™ is a valuable tool to verify a range of NbS applications.^[6]

The eight criteria (see Figure 2) and 28 indicators of the Standard provide clear, science-based and widely consulted parameters for benchmarking NbS interventions.^[6, 7] The interdependent and non-hierarchical nature of its eight criteria implies that to be in adherence an intervention has to at least partially address each criterion. As a result, inadequacy in just one criterion means that the intervention in question is not in adherence with the Standard and therefore cannot be verified as an NbS.

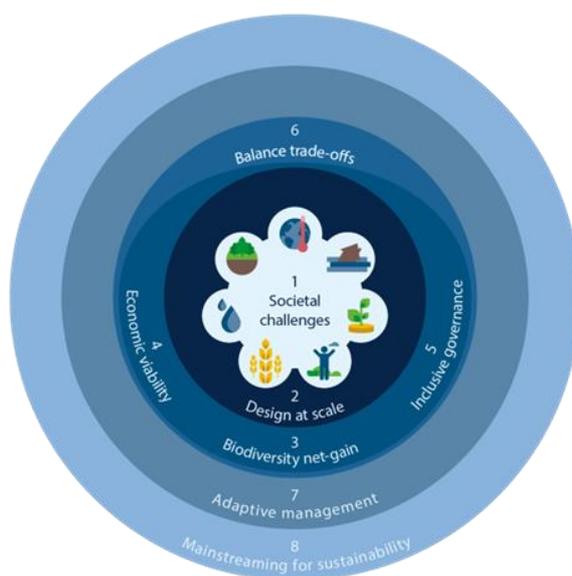


Figure 2: The eight criteria of the IUCN Global Standard for Nature-based Solutions™ (© IUCN)

Adherence with the Standard means that the NbS action sufficiently addresses critical environmental, social and economic dimensions (aligning with the Sustainable Development Goals (SDGs)), legal and policy considerations, inclusive governance and participation aspects. Due to its compatibility with the ISEAL Alliance Code of Good Practice, the Standard provides the necessary focus on achieving impact at scale, preventing misuse and applying safeguards for the verification and/or subsequent improvement of interventions to be considered NbS.

The process-oriented quality of the Standard also provides additional value for analysing and extracting key lessons learned from case studies. It allows reflection on and increases understanding of challenges and opportunities, differentiates between strong and weak NbS interventions, and provides room for corrective and adaptive management and learning throughout the intervention cycle.

The international case studies presented here provide insights into particular success factors and challenges for NbS interventions and, thus, promote and enhance uptake, implementation and financing of NbS. Further, they support an effort to build a prototype database of NbS cases using the Standard as a lens through which to understand verification and lessons learned.

2 Methodology

The prototype database of NbS cases was conceived through an agreed documentation framework, the selection of illustrative international case studies, and the analysis and presentation of five international case studies in accordance with the documentation framework.

Inclusivity and gender considerations were given particular attention and wherever possible, disaggregated data is provided. By highlighting the inclusion of different knowledge systems and participation in decision-making of those affected by NbS interventions (including Indigenous peoples and local communities, women and youth), the case studies demonstrate the critical importance of inclusive governance for the success of an NbS intervention. They also underscore the need for transparency and equity in order to safeguard people and culture. Especially concerning the role of women, the case studies highlight multiple dimensions of gender and gender-responsive approaches in the design and implementation of NbS interventions to understand and overcome gender-based gaps. Such gaps and inequalities in the context of NbS relate to the roles of men and women in society and the economy and how these roles impact access and control over resources, participation, decision-making and protection and enforcement of rights. Not considering the needs and perspectives of women, Indigenous peoples and local communities, and marginalised groups in the design and implementation of NbS could lead to their exclusion from the benefits derived from such solutions and reinforce gender-discrimination and inequalities.^[6, 7, 8, 9] The case studies reflect and highlight gender-responsive and inclusive approaches to the extent possible.

2.1 Documentation framework

In order for the case studies to gain impact, they must be documented in a coherent and consistent manner also to allow them to be uploaded to strategic databases making them widely accessible to different users. To facilitate this, a combined template – the documentation framework – was developed to ensure that the required information would be collected and collated. In order to ensure this framework was complementary with the most relevant databases, a mapping of NbS resources from the EU project NetworkNature was utilised (not yet publicly available).^[10] Subsequently, relevant information from the case studies related to the documentation framework was gathered.

The case study documentation framework captures key information about each of the case studies. It was designed to combine inputs from the IUCN Global Standard for NbS™ and the information required by the *PANORAMA: Solutions for a healthy planet* case study database to help classify each of the case studies (see CCICED Special Policy Study: Value Assessment of Nature-based Solutions^[11]).

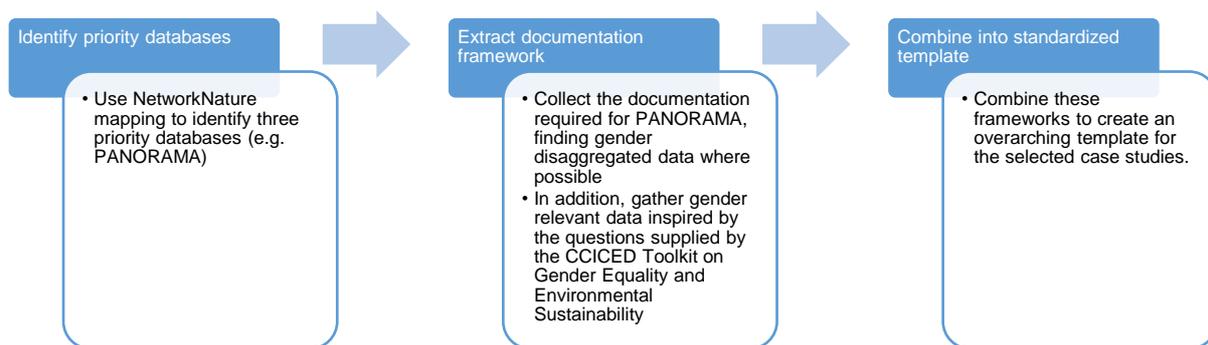


Figure 3: Workflow for the development of the documentation framework of case studies (Source: Figure developed by the authors of this report)

2.2 Case study selection and documentation

The case study selection process focussed on identifying and agreeing on the five most relevant international case studies. It was agreed that the selected cases should provide a good representation across societal challenges, ecosystems and sectors.

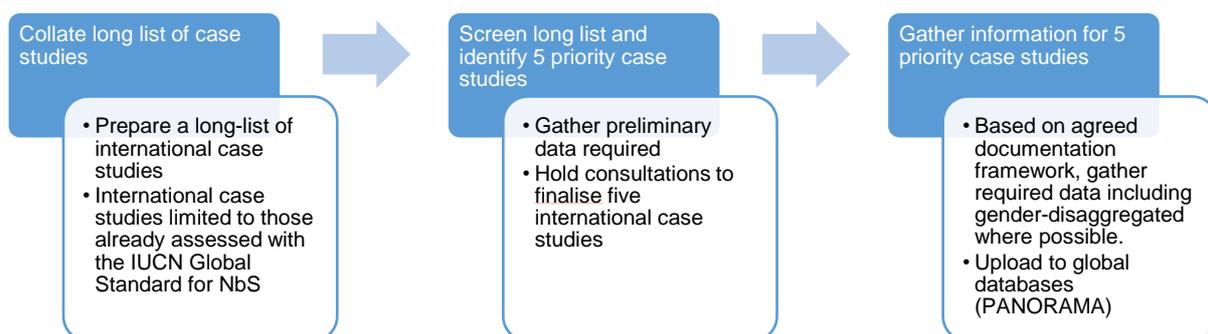


Figure 4: Workflow for the selection and documentation of case studies (Source: Figure developed by the authors of this report)

The initial longlist of international case studies was drawn from cases that had already undergone a full assessment with the IUCN Global Standard for NbS™. In accordance with the classification discussed in Section 2 of the CCICED Special Policy Study Report on “Value Assessment of Nature-based Solutions”, discussions with the Special Policy Study team and the availability of sufficient qualitative and quantitative information, five case studies were selected, analysed and documented. The results can be found below and on the *PANORAMA: Solutions for a healthy planet* case study database.^[12]

3 International case studies

The following five international case studies were analysed: (1) Agroforestry systems for sustainable cocoa farming in the Lachuá Ecoregion, Guatemala, (2) Medmerry managed coastal realignment, (3) Flood-based agriculture in the upper Mekong delta floodplain, (4) Maristanis integrated coastal and wetlands management, and (5) Sustainable aquaculture and innovative seaweed farming in Zanzibar. Case (1) was included in the final report *Special Policy Study Value Assessment of Nature-based Solutions*² and is, thus, not included here. The other four case studies are presented in full.

Table 1: Summary of international cases

Case	Name	Location	Type ³ [2, 12]	Link to PANORAMA Solution
1	Agroforestry systems for sustainable cocoa farming in the Lachuá Ecoregion	Lachuá Ecoregion, Guatemala	Type 2	https://panorama.solutions/en/solution/agroforestry-systems-sustainable-cocoa-farming-lachua-ecoregion
2	Medmerry managed coastal realignment	Medmerry, Selsey, United Kingdom	Type 1 and Type 2	https://panorama.solutions/en/solution/medmerry-managed-coastal-realignment
3	Flood-based agriculture in the upper Mekong delta floodplain	Upper Mekong Delta, Vietnam	Type 2	https://panorama.solutions/en/solution/flood-based-agriculture-upper-mekong-delta
4	Maristanis integrated coastal and wetlands management	Gulf of Oristano, Sardinia, Italy	Type 1	https://panorama.solutions/en/solution/maristanis-integrated-coastal-and-wetlands-management
5	Sustainable aquaculture and innovative seaweed farming in Zanzibar	Zanzibar, Tanzania	Type 2	https://panorama.solutions/en/solution/seaweed-farming-zanzibar-addressing-common-challenge-aquaculture-and-marine-conservation

(Source: Table developed by the authors of this report)

² The Special Policy Study is available from the CCICED website here: <https://cciced.eco/research/special-policy-study/sps-2-value-assessment-of-nature-based-solutions/>

³ Type 1 interventions are solutions that make better use of existing natural and protected ecosystems; Type 2 interventions are solutions for sustainable management of restored and managed ecosystems, including innovative land-use planning protocols

3.1 Medmerry managed coastal realignment

Location: Medmerry, Selsey, United Kingdom

Main implementing organisation: Environment Agency of the United Kingdom

Other implementing organisation: Royal Society for the Protection of Birds (RSPB)

Type of NbS intervention^[2, 13]: Type 1 (solution that makes better use of existing natural and protected ecosystems) and Type 2 (solution for sustainable management of restored and managed ecosystems, including innovative land-use planning protocols)



Figure 5: Aerial view of the intervention area taken in September 2013 (© Environment Agency of the United Kingdom)

Case overview: Medmerry was historically protected by a narrow shingle embankment, holding back only the very smallest coastal storms. An increase in the number of coastal flooding events and overwashing occurring several times per year, exacerbated by sea level rise and climate change, established that the existing shingle bank was insufficient to protect against floods. This posed significant actual and potential risks to life and caused damage to property and infrastructure. Additionally, coastal squeeze caused losses of coastal habitat. In response, the Environment Agency of the United Kingdom delivered a GBP 27 million project to realign the defences inland, providing significantly improved flood defences to allow for managed flooding. The intervention created 300 hectares of habitat (183 of which is intertidal, including mudflat, salt marsh and transitional grassland), protection of more than 300 homes, road infrastructure and a wastewater treatment plant and a boom to local tourism and recreation, with 22,000 visitors each year. The main positive impacts of the

Medmerry managed coastal realignment include improved flood risk management, creation of wildlife habitats, enhanced landscape quality and provision of recreational facilities.

Table 2: Characteristics and benefits of the Medmerry managed coastal realignment based on the criteria of the IUCN Global Standard for Nature-based Solutions™

Overall assessment	Strong adherence with the IUCN Global Standard for Nature-based Solutions™
Intervention status	All major NbS restoration activities have been completed and monitored. The focus is now on the continuous sustainable management of the intervention area.
Criterion 1: NbS effectively address societal challenges	<div style="text-align: center;">  <p>Disaster risk reduction</p> </div> <p>At the project planning stage, local communities, government representatives and statutory organisations were involved in the development of a vision for Medmerry, highlighting a wide range of impacts, including societal and environmental. The vision exercise highlighted disaster risk reduction, especially flooding, as a major priority. Additionally, environmental assessment data of flood events (the most serious recent event before the start of the project occurred in 2008 and caused over GBP 5 million in economic damage and required evacuation due to risk of life^[14]), flood risk mapping and modelling confirmed flooding as the main societal challenge. These assessments were based on global best practices. Impacts of climate change were found to be an exacerbating factor.</p>
Criterion 2: Design of NbS is informed by scale	During the planning phase, a full Environmental Impact Assessment (EIA) was carried out and a full risk register developed. To achieve flood reduction and environmental improvement, 200 miles of the UK coast were assessed to determine the most promising opportunities for NbS, considering landscape, impacts on people and surrounding habitats. In addition, wider impacts across the region were assessed in accordance with the National Flood and Coastal Erosion Risk Management Strategy for England, including people, businesses, infrastructure and environments. While the coastal realignment provided many new business opportunities, these were not considered in depth during the planning phase.
Criterion 3: NbS result in a net gain to biodiversity and ecosystem integrity	The expected impacts on the ecosystems in the intervention areas were captured in an Environmental Impact Assessment (EIA). These included mitigation measures for any risks to biodiversity during construction. For

	<p>instance, water voles were translocated prior to the start of the works. Baseline data on biodiversity was gathered as well as biodiversity outcomes benchmarked and identified during the five-year monitoring period now continued by RSBP, which has been managing most of the project area since 2013 as a nature reserve as part of a 99-year lease.</p> <p>Key biodiversity outcomes^[14, 15]:</p> <ul style="list-style-type: none"> • around 300 ha of coastal habitat (183 ha of intertidal habitat and 80 ha of transitional grassland) and a network of freshwater habitats created; • regulatory services enhanced through the coastal realignment: climate, water, natural hazard and erosion regulation, water purification and waste treatment; • as part of the monitoring process, there was a reported increase of saltmarsh plants (including nine considered nationally scarce), breeding bird populations (e.g. avocet, ringed plover, wintering wildfowl), invertebrate abundance, marine mollusc species, water voles, reptiles and fish diversity.
<p>Criterion 4: NbS are economically viable</p>	<p>A cost-effectiveness assessment of the planned intervention and an options appraisal were undertaken during the planning phase. The proposed options were assessed on their costs and benefits, technical viability and environmental outcomes.</p> <p>Key economic benefits^[14, 15]:</p> <ul style="list-style-type: none"> • economic benefits are estimated at GBP 91.7 million (three times higher than the project cost of GBP 28 million), including GBP 13.5 million in environmental benefits; • 348 residential and commercial properties as well as infrastructure serving 5,000 households protected; • new coastal landscape, including an intertidal wetland that sequesters carbon; • an estimated GBP 168 million in economic benefits are expected over a 100 year period; • around 22,000 visitors to the area annually.
<p>Criterion 5: NbS are based on inclusive, transparent and empowering governance processes</p>	<p>The project placed particular emphasis on stakeholder engagement and participation of local communities in all phases of the project. This included proactively providing information about the benefits of the coastal realignment, gaining widespread support for the intervention and seeking community views and inputs. A comprehensive stakeholder analysis allowed a mapping of how best to engage with the different stakeholders. The Medmerry Stakeholder Advisory Group was established, made up of key individuals of the local community, including Parish Councils, local businesses and residents most affected by the coastal realignment. The Advisory Group helped shape the</p>

	design of the project and met regularly to discuss any issues and concerns. Although a complaints procedure was in place, which enabled affected individuals to raise concerns through an independent ombudsman, more could have been done to ease the associated bureaucratic burden. The active and intentional involvement of the local community and subsequent support generated, contributed significantly to the success of the project. ^[15]
Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	The costs and benefits of the NbS intervention were mapped in line with UK government assessment criteria and included the surrounding areas of the intervention site (landscape level). Annual meetings with stakeholders ensured that the NbS intervention provided the expected benefits. Public access (footpaths, cycle paths and bridleway) to the newly established nature reserve was enhanced and recreational areas provided, while maintaining a balance between recreational activities and undisturbed conservation areas.
Criterion 7: NbS are managed adaptively, based on evidence	The expected benefits were documented in the planning phase and baselines established. These informed the ongoing monitoring of NbS impacts. Immediately after project completion, a five-year monitoring programme was implemented. Annual reports summarised findings and lessons learned, which were shared and discussed with local stakeholders, external consultants, academia and risk management authorities in south England. Approaches to project planning and implementation were adjusted as needed. For instance, the approach applied to engaging the local community was adapted based on early experiences and analysis of challenges and barriers. ^[15]
Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context	While lessons learned have been captured in annual reports and through the monitoring framework, these have only been shared with a limited audience. The main benefits that have been communicated relate to reduced flood risk and created habitat. The success of the Medmerry managed coastal realignment along with other NbS interventions informed the organisational national strategy and increased the focus on NbS nationally. The project was characterised by comprehensively considering climate change and biodiversity throughout the design, implementation and monitoring phases.

(Source: Table developed by the authors of this report based on the IUCN Global Standard for Nature-based Solutions™ self-assessment results for this case study)

Lessons learned:

Participatory and collaborative approaches. Inclusive governance and collaboration with a wide range of stakeholders, especially the local community, ensured effective assessment of societal challenges and priorities in the given context, increased understanding and acceptability of the proposed solution and enabled effective planning, implementation and maintenance/management of the NbS intervention, with a possibility for creative problem-solving.

Transparency. Transparent and structured engagement and participation of the local community throughout the project and in decision-making processes – starting with the design stage – helped to address concerns, build trust and create ownership.

Involvement of experts. The involvement of specialist groups and experts to address specific challenges, such as habitat conservation, the preservation of archaeological findings, etc. proved essential to minimise impacts on project implementation timelines and to resolve stakeholder concerns.

Robust monitoring framework. Continuous and regular monitoring was essential and the use of novel techniques (e.g. satellite imagery) and various approaches offered valuable insights on the complexity of processes in the intervention site. A clear monitoring plan that linked findings to project objectives and measures of success provided data on the impact of the NbS intervention.

3.2 Flood-based agriculture in the upper Mekong delta floodplain

Location: Upper Mekong Delta, Vietnam

Main implementing organisation: International Union for Conservation of Nature (IUCN)

Other implementing organisation: World Bank, Ministry of Agriculture and Rural Development, Provincial Governments of Long An, Dong Thap and An Giang

Type of NbS intervention^[2, 13]: Type 2 (solution for sustainable management of restored and managed ecosystems, including innovative land-use planning protocols)



Case overview: Triple rice mono-cropping by poldering has been the dominant agricultural practice in the floodplains of the Mekong Delta, resulting in significant losses of the seasonal floodplain in the Delta⁴ as well as a decline of ecosystem functions, including reduced land fertility, declining flood resilience and decreased aquatic habitat and biodiversity. The negative impacts caused by increased flood risk also caused transboundary challenges between Vietnam and Cambodia. Based on documented farmer knowledge and experience, IUCN promoted and improved locally-practiced, flood-based (wetland) agriculture and livelihood models in the Vietnamese provinces of An Giang, Dong Thap and Long An. Flood-based livelihoods were encouraged as a financially viable, low risk alternative to triple rice cropping, to enhance economic and social resilience as well as to conserve and restore the biodiversity found in Mekong Delta freshwater wetlands/floodplains.

The NbS intervention considered three systems - floating rice systems, lotus farming systems and rice aquaculture systems. Due to increasing weather extremes, hybrid solutions were also explored (combination of dykes and floodplains), to enable controlled flooding and adaptive approaches to overcome risks of drought and to manage the arrival and recession of floods. While the main focus of the NbS intervention was on farmers adding an additional flood-based crop in open flood (no dyke) and flood control zones (low dyke), the utility of replacing low value irrigated crops with higher value flood-based crops in closed control zones (high dyke) was also considered. In order to achieve the full set of biodiversity and human wellbeing benefits derived from moderated floods, interventions need to be scaled up across the entirety of the Mekong Delta floodplain. To do so, a follow-up project is currently being developed under the Green Climate Fund (GCF).

Figure 6: Flood-based farming practiced by the local community in the Mekong delta (© IUCN)

Table 3: Characteristics and benefits of flood-based agriculture in the upper Mekong delta floodplain based on the criteria of the IUCN Global Standard for Nature-based Solutions™

Overall assessment	Adequate adherence with the IUCN Global Standard for Nature-based Solutions™
Intervention status	The concept of flood-based agriculture as an NbS emerged as part of a larger Programme of Work starting with the 2013 Mekong Delta Plan, which leveraged a number of projects that explored its feasibility. Initial studies of farmer initiatives and proof of concept in IUCN pilot sites were completed between 2015 and 2018. These fed into the design and implementation of similar projects in the region (e.g. those by the World Bank, IUCN and FAO). Efforts towards an IUCN-led large-scale and transformative GCF-funded project for the Mekong Delta will build on and scale up the results of the various initiatives and enhance

⁴ Between 2000 and 2011, the volume of flood storage has halved from 9,200 billion m³ to 4,700 billion m³ (ICEM (2015) A Guide to Resilient Decision Making in the Mekong Delta. Vietnam: World Bank)

	existing partnerships.
<p>Criterion 1: NbS effectively address societal challenges</p>	<div style="text-align: center;">   </div> <p style="text-align: center;"> Disaster risk reduction Economic and social development </p> <p>The major flood in 2011 demonstrated the increased damages incurred due to loss of floodplains/retention areas in the Upper Mekong Delta caused by an intensification of rice farming. A debate over the sustainability of intensified rice farming policies that use poldering emerged. The range of societal challenges and benefits were captured in the 2013 Mekong Delta Plan and the preparations for a World Bank investment project (Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project (ICRSL)) through consultations and interviews with farmers as well as in scientific literature. They included loss of the Mekong Delta floodplain and thus flood absorption capacity due to intensive rice growing by poldering, reduction of land fertility and aquifer recharge area, decline of aquatic habitats and biodiversity as well as growing socio-economic inequality due to greater input costs to compensate for increased pest risk, lost fisheries, sediment and soil fertility.</p>
<p>Criterion 2: Design of NbS is informed by scale</p>	<p>The design of the intervention recognised the challenges across the Mekong Delta, which were also captured in the 2013 Mekong Delta Plan. The NbS intervention strategically addressed knowledge gaps, capacity needs of farmers and regional planning challenges, working collaboratively with other similar initiatives. The intervention responded to interactions between the environment and society in terms of improving livelihoods through flood-based agriculture. The economic component was not sufficiently considered in the design of the initial intervention, though marketable products were identified. While initial IUCN pilot interventions remained limited and small-scale, collaboration across similar projects and recent policy developments currently support the development of a large-scale intervention across the 1.4 million ha of the Upper Mekong Delta floodplain.</p>
<p>Criterion 3: NbS result in a net gain to biodiversity and ecosystem integrity</p>	<p>The focus of the intervention was on modified wetland ecosystems (formally zoned as agricultural land under private tenure) and thus excluded practices carried out in protected and conserved areas. In light of the extensive scientific evidence on the risks of rice intensification, it was possible to assess the status of ecosystems as well as drivers of change and biodiversity loss. Due to the rather small scale of the IUCN pilot interventions, no concrete data or monitoring frameworks to capture the positive biodiversity outcomes were implemented. Instead, outcomes were captured in general terms, including provisioning, regulating, supporting and cultural functions of the floodplain. Detailed</p>

	<p>monitoring for potential, unintended adverse consequences on nature arising from the intervention was not carried out.</p> <p>Key investments in biodiversity outcomes^[16]:</p> <ul style="list-style-type: none"> • Investments into 450 ha of flood-based livelihoods to enhance ecosystem functions of floodplains, which resulted in the conservation or restoration of approx. 6.7 million m³ of flood retention capacity supporting aquifer recharge, the reduction in land subsidence and the conservation or restoration of aquatic habitat/biodiversity; • additional benefits were observed from wild fisheries, mitigation of river erosion through the re-establishment of natural hydrology of seasonal flooding and increased land fertility, including through sediment deposition due to the seasonal flooding.
<p>Criterion 4: NbS are economically viable</p>	<p>A feasibility study for a GCF proposal revealed that several hundred thousand farmers and a number of downstream towns would benefit financially from flooding if seasonal flood-based agriculture were applied. In addition, cost-benefit analyses were carried out on the profitability of flood-based crops and the cropping system as a whole in comparison to mono-rice cropping. The NbS intervention did not consider the development of clear value chains and business models, which hampered securing long-term funding sources to maintain the NbS. Instead, the intervention relied on short-term, project-based grant funding. The planned GCF project could help overcome some of these shortcomings.</p> <p>Key expected economic benefits^[16]:</p> <ul style="list-style-type: none"> • flood-based livelihoods have the potential to be 1.5 to five times more profitable than intensive rice cropping; • floating rice systems could generate around USD 6,400 per ha per year, while triple rice cropping systems generate only USD 3,100 per ha per year; • where farmers add a flood-based crop in open flood or flood control zones, additional income between USD 2,293 – USD 5,744 per ha per year could be generated depending on the flood-based agriculture system applied^[17]; • in open flood and flood control zones, no investments need to be made towards flood management, while in closed control zones (high dykes), sluice coordination by the local government is necessary; flood-based agriculture could serve as an incentive to stop conversion of low dykes to high dykes, which in turn helps preserve the floodplains in the Upper Mekong Delta.
<p>Criterion 5: NbS are inclusive, transparent and</p>	<p>No grievance mechanism was put in place for the IUCN pilot NbS interventions, due to the small-scale and limited number of farmers involved. A grievance</p>

empowering governance processes	mechanism was put in place for the larger scale World Bank ICRSL project implementation as was required by World Bank safeguard policies. A stakeholder analysis provided insights into which stakeholders were directly and indirectly affected. Stakeholders provided inputs into the regional vision and plans for phasing out intensive triple rice crop farming. In addition, since farmers have private tenure over their land, farmer participation in decision-making and ownership of such decisions was essential. National Resolution 120 entitled “For a sustainable and climate resilient Mekong Delta” and Decision 593 defined the roles and responsibilities of different actors in decision-making processes and recognised the need for policy reform rather than small-scale community-based solutions. The forthcoming Green Climate Fund proposal recognises that transboundary solutions and coordination between Vietnam and Cambodia should be sought.
Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	Several cost-benefit analyses provided insights into the main trade-offs. To compensate farmers for conserving and restoring ecosystem services of the floodplains, they received support to cover the costs of the transition to flood-based agriculture and resist pressures to convert additional low dyke areas into closed control zones with high dykes. The government issued Decision 593 and Resolution 120 that defined the need for an inter-provincial coordination mechanism. However, it is not yet operational. This constitutes a shortcoming for the NbS intervention. For the World Bank ICRSL project, social and environmental safeguards were put in place. However, the limits of trade-offs were not discussed in detail. In some areas a hybrid model was used, with low dykes controlling the timing of flood arrival/recession to support double-cropping and flood-based cropping (instead of the traditional third rice crop). In the case of lotus farming systems, flood-based agriculture enabled diversification of activities, including fish raising, ecotourism and recreational opportunities. In the future, value chains, especially for rice production, will need to be considered in more detail to support the new flood-based agriculture model and gain support from rice exporters.
Criterion 7: NbS are managed adaptively, based on evidence	While National Resolution 120 provided an enabling policy environment for flood-based agriculture, examples of interventions that ran counter to the resolution remained. This weakened the impact of the NbS intervention and underlined that monitoring needed to be improved. There is no evidence as to whether there has been a government response to adapt the approach. Limited technical and institutional capacity was identified as a key factor. Lessons learned from the IUCN pilots and experiences from other similar initiatives are shared regularly at the Mekong Delta Development Partners Working Group and Annual Mekong Delta Forums. Further, the emerging interest from academia in flood-based agriculture is already producing relevant data and information. Additionally, the preparation of the planned Green Climate Fund

	proposal considers the above challenges.
Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context	<p>The NbS intervention built on the 2013 Mekong Delta Plan, which recommended high-value double rice cropping in combination with seasonal flood-based agriculture/aquaculture to manage flood risks. This influenced the promulgation of National Resolution 120, entitled “For a sustainable and climate resilient Mekong Delta”; this policy was adopted in November 2017 and stipulates that nature-based adaptation models should be selected that are environmentally sound and achieve sustainable development based on ‘actively living with the floods’. The Mekong Delta Forum provided a space for knowledge exchange on lessons learned and endorsement of a common vision for the Upper Mekong Delta, including a move to more natural land and water uses.</p> <p>An IUCN-led Green Climate Fund proposal is under preparation to ensure continuity of efforts and to address transboundary challenges.</p>

(Source: Table developed by the authors of this report based on the IUCN Global Standard for Nature-based Solutions™ self-assessment results for this case study)

Lessons learned:

Legal and regulatory framework. Supportive legal and policy frameworks opened up opportunities for a change in land use and facilitated partnerships across related initiatives for the adoption of flood-based agriculture in open flood and flood control zones.

A need for market incentives. The NbS intervention in Vietnam could have profited from a more holistic approach regarding the diversification of marketable products derived from flood-based agriculture to provide additional market incentives. Through consultations and analysis of lessons learned, market access and a lack of value chain development were identified as the greatest challenges for scaling up flood-based agriculture. This is influencing the design of the future Green Climate Fund project.

Overcoming small-scale and time-bound interventions. A hybrid system of flood-based agriculture with some flooding control system of low dykes could help manage risks of early/heavy floods and droughts. The highest potential lies in the closed flood zones with high dykes through the opening of sluices during seasonal floods to restore the flood retention area. However, existing projects have not yet addressed this potential. This demonstrates that for NbS interventions to achieve positive impacts at scale, small-scale (often focussed on pilots), project-based and time-bound interventions are not sufficient to address complex societal challenges. Nevertheless, partnerships between related interventions in the region contributed to institutional and policy development as well as supported greater cross-sectoral coordination.

3.3 Maristanis integrated coastal and wetlands management

Location: Gulf of Oristano, Sardinia, Italy

Main implementing organisation: MEDSEA Mediterranean Sea and Coast Foundation

Type of NbS intervention^[2, 13]: Type 1 (solution that makes better use of existing natural and protected ecosystems)



Figure 7: Area archeologica di tharros, San Giovanni di Sinis, Cabras, Italy (© Léonard Cotte, Unsplash)

Case overview: The Gulf of Oristano is home to a number of freshwater and coastal wetlands. Overexploitation, land-use changes, hydrological alterations, pollution and anthropogenic pressures pose risks to ecosystem health and biodiversity as well as the economic, social and cultural benefits derived from the wetland ecosystems. The coastal area of the Gulf of Oristano includes six Ramsar sites, 19 Natura 2000 sites and one Marine Protected Area across approx. 7,700 ha along 140 km of coastline. The main economic activities in the region include artisanal fishing, agriculture and tourism.

The proposed NbS intervention focussed on creating an integrated management model offering a long-term management strategy for the coastal wetlands found in the Gulf of Oristano – a new regional park. It contributed to balancing social and environmental needs and paved the way to recognise the economic and cultural potential of the wetlands. Since the implementation of activities is still ongoing, the IUCN Global Standard for Nature-based Solutions™ self-assessment was used

to identify entry points to strengthen the NbS intervention. This analysis was carried out by the UNEP Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC) of the Mediterranean Action Plan (MAP) of the UN Environment Programme and recommendations published in a report.^[18]

Table 4: Characteristics and benefits of the Maristanis integrated coastal and wetlands management based on the criteria of the IUCN Global Standard for Nature-based Solutions™

Overall assessment	Adequate adherence with the IUCN Global Standard for Nature-based Solutions™
Intervention status	Implementation of the NbS intervention is ongoing.
<p>Criterion 1: NbS effectively address societal challenges</p>	<div style="display: flex; justify-content: space-around; align-items: center; text-align: center;"> <div style="width: 20%;">  <p>Climate change mitigation and adaptation</p> </div> <div style="width: 20%;">  <p>Economic and social development</p> </div> <div style="width: 20%;">  <p>Environmental degradation and biodiversity loss</p> </div> <div style="width: 20%;">  <p>Food security</p> </div> </div> <p>A review of management plans for sites of community importance and special protected areas in the Gulf of Oristano helped identify the key societal challenges that needed addressing. These management plans also provided insights into human activities in the region, such as aquaculture and fishing. General information on drivers and responses of the identified societal challenges was gathered; however, there was no data specific to the wetlands in the Gulf of Oristano. An area for improvement identified as part of the self-assessment relates to strengthening the links to human wellbeing outcomes.</p>
<p>Criterion 2: Design of NbS is informed by scale</p>	<p>The aim of the intervention was to overcome fragmentation between the various wetland ecosystems in the Gulf of Oristano. The collaboration established among 11 municipalities through the Oristano Coastal Wetlands Contract helped advance coordination, including across sectors. Further, interactions between the economy, society and ecosystems fed into the design of the intervention and considered various activities, including fishing, flood risk management, agriculture and tourism among others. Vulnerability and risk maps were developed. However, it was recommended that additional data be gathered to understand risks across the catchment and better define the adaptation and resilience actions to climate change, including related to connectivity between wetlands in the Gulf of Oristano.</p>
<p>Criterion 3: NbS result in a net gain to biodiversity and</p>	<p>A review of management plans for sites of community importance and special protected areas in the Gulf of Oristano helped understand the current state of wetland ecosystems and biodiversity in the region. Regular monitoring is</p>

ecosystem integrity	<p>ensured through an integrated information system, the Oristano Wetland Observatory. In addition, the implementation of a Wetland Index is planned. Options to enhance integrity of the wetland ecosystems were implemented. These included the restoration of ecological connections, creation of buffer zones and preservation of native habitats.</p> <p>Key biodiversity outcomes:</p> <ul style="list-style-type: none"> • Strengthened conservation of coastal and marine habitats; • Reinforced resilience to climate change impacts; • Reduced water consumption, abstraction, pollution and contamination.
Criterion 4: NbS are economically viable	<p>This criterion turned out to be the weakest for this NbS intervention. No specific cost-effectiveness study was conducted. Cost-benefit analyses and consideration of alternatives were conducted only for a limited number of the wetlands found in the Gulf of Oristano. The long-term resourcing of the NbS was partially secured through the Oristano Coastal Wetlands Contract. Additional resourcing is expected through the new Sardinia Strategy for 2030 as well as through the new funds from the Recovery and Resilience Plan that is currently being developed. Moreover, the institution of a new protected area (regional park) will be an instrument to attract new funds and ensure the ongoing management of wetlands. A full economic analysis was suggested as a priority action going forward to secure the continuity and sustainability of the NbS intervention.</p>
Criterion 5: NbS are based on inclusive, transparent and empowering governance processes	<p>The intervention involves the 11 municipalities that cover the six Ramsar sites. They signed a cooperation agreement for joint decision-making in the form of the Oristano Coastal Wetlands Contract. As part of the implementation of the NbS intervention, relevant public and private sector stakeholders were consulted. They were identified based on a stakeholder analysis and include affected sectors. However, no specific grievance mechanism was implemented to facilitate feedback or resolution of complaints and challenges. This was identified as a major shortcoming. The establishment of a formal, clear and well-documented feedback grievance mechanism as well as participatory decision-making processes respecting the rights and interests of all participating and affected stakeholders were added as priority actions going forward.</p>
Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	<p>A basic analysis of the rights, usage of and access to land and resources was done. It revealed that the regional government owns the wetlands, while surrounding areas are either under public or private ownership. Concessions are given to fisher cooperatives. The results of the self-assessment revealed a major shortcoming in agreeing limits of trade-offs and related safeguards. This aspect was included as a priority action moving forward.</p>
Criterion 7: NbS are managed adaptively, based	<p>The Oristano Coastal Wetlands Contract defined guidelines and actions that steered the definition of intended outcomes and actions and informed</p>

on evidence	monitoring and evaluation of the intervention. The Integrated Information System developed as part of the initiative provided uniform and regular data on the wetlands in the Gulf of Oristano. The collected information will be used for regular monitoring over time. However, no concrete plan of how the monitoring may trigger an adaptive management response was prepared.
Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context	The Oristano Coastal Wetlands Contract is an important document supporting the implementation of integrated, coordinated and collaborative approaches at scale. The Contract is an important legal instrument as it reinforces the commitment towards joint policy action to overcome fragmentation of coastal wetlands management, looking towards the establishment of a new regional protected area, which is the first aim of the Action Plan attached to the Contract. It provides the foundation for NbS actions in the Gulf of Oristano. In addition, national and global targets were key reference points for the design of the NbS intervention and Ramsar information sheets were updated for the six Ramsar sites. A new Sardinia Strategy for 2030 is under preparation by the regional government. Steps will be taken to integrate the results of the NbS intervention into the strategy to promote its long-term continuity.

(Source: Table developed by the authors of this report based on the IUCN Global Standard for Nature-based Solutions™ self-assessment results for this case study)

Lessons learned:

Defining priority and corrective actions to strengthen the intervention. An analysis of the IUCN Global Standard for Nature-based Solutions™ indicators that have been insufficiently or only partially addressed helped to make recommendations for improvement and to identify concrete corrective actions to strengthen the implementation of the NbS intervention.^[18] This demonstrates how the self-assessment can be used to strengthen the design and implementation of NbS interventions.

Strong legal basis. The adoption of the Oristano Coastal Wetlands Contract by the 11 municipalities provided an important legal basis and framework to advance integrated management of six wetlands in the Gulf of Oristano. It provided strategies and actions that support ongoing efforts toward the establishment of a new regional park.

3.4 Sustainable aquaculture and innovative seaweed farming in Zanzibar

Location: Zanzibar, Tanzania

Main implementing organisation: International Union for Conservation of Nature (IUCN)

Other implementing organisation: Ecosystem-based Aquaculture Group of the International Union for Conservation of Nature Commission on Ecosystem Management (IUCN CEM)

Type of NbS intervention^{2, 13}: Type 2 (solution for sustainable management of restored and managed ecosystems, including innovative land-use planning protocols)



Figure 8: Women working in seaweed farms in Pemba, Zantibar (© R. le Gouvello)

Case overview: Since 1990, Zanzibar has become a primary seaweed producer in Africa. Seaweed farming activities are usually small-scale and carried out in the intertidal zones largely in marine conservation areas, near mangroves and coral reefs. Eighty-eight per cent of seaweed farmers are women, making this an important activity to elevate their economic status and role in the community.^[19] Climate change, the absence of producer associations, difficulties in accessing international markets and insufficient protection of coastal ecosystems have contributed to a decline in the production of higher-valued seaweeds. While the co-management approach applied in Zanzibar aims to protect coastal ecosystems and habitats, enhance artisanal fisheries and mariculture, shortcomings in the management remain. New approaches to aquaculture and marine conservation have emerged only recently (in terms of concrete projects since 2014), with the case in Zanzibar serving as a first attempt to test the level of adherence of seaweed farming with the IUCN Global Standard for Nature-based Solutions™.

Table 5: Characteristics and benefits of sustainable aquaculture and innovative seaweed farming in Zanzibar based on the criteria of the IUCN Global Standard for Nature-based Solutions™

Overall assessment	<p>This case study is currently not in adherence with the IUCN Global Standard for Nature-based Solutions™ as it falls short in two criteria, namely criteria 3 and 6. It should also be noted that the self-assessment was carried out as a desk review. Further, means of verification were not always available, as data relating to certain indicators were not gathered. To conduct a more comprehensive assessment, local stakeholders should be involved as key informants.</p> <p>Nevertheless, the self-assessment provided insights into areas for improvement as to how interventions are designed, implemented and monitored. It also provided insights into knowledge and data gaps, which prompted critical questions and corrective actions that need to be addressed going forward.</p>
Intervention status	Initial activities are completed. Future actions, research and knowledge needs are being assessed.

<p>Criterion 1: NbS effectively address societal challenges</p>	<div style="text-align: center;">   </div> <p style="text-align: center;"> Economic and social development Food security </p> <p>The societal challenges were identified, documented and prioritised through a theory of change exercise. This included a stakeholder workshop and engagement with local authorities to verify the information. Several studies provided insights into the positive outcomes of mariculture and seaweed farming, which included gender equality, economic revenues provided to women and the consequences on their life, including increased autonomy, empowerment and role in the communities. Although there was an understanding of the internal and external risks of the intervention, the SWOT analysis carried out for the Zanzibar case showed that a number of weaknesses and threats have not yet been addressed.</p>
<p>Criterion 2: Design of NbS is informed by scale</p>	<p>The application of integrated coastal zone management (ICZM) ensured a recognition of interactions between the economy, society and ecosystems. A more holistic approach should be applied in future interventions to take into account the impact of value chains and access to markets for local livelihoods. Some synergies across sectors were identified. However, since the theory of change exercise was not completed due to time constraints, complementary interventions were not integrated fully into the design of the intervention. It was recommended to work with stakeholders to complete this exercise and achieve synergies for future interventions, especially between aquaculture, marine conservation and other relevant sectors.</p>
<p>Criterion 3: NbS result in a net gain to biodiversity and ecosystem integrity</p>	<p>This criterion was deemed to be insufficiently addressed by the intervention. The analysis of the biodiversity benefits achieved through this intervention were largely based on a desk review of existing literature and information rather than a specific assessment, monitoring framework or thorough and collective effort with key informants and stakeholders. As was highlighted in a recent study published by IUCN, criterion 3 is the most difficult to achieve for seaweed farming and aquaculture.^[19] There is a clear need to establish measures to reduce, control and mitigate impacts on biodiversity. Moreover, better documentation of the ecological state of the ecosystem, ecosystem connectivity and assessment of impacts is required. In this regard, the IUCN Global Standard for Nature-based Solutions™ is an important tool to call attention to these issues and helps improve interventions that would otherwise cause harm to coastal and marine ecosystems and biodiversity.</p>
<p>Criterion 4: NbS are economically viable</p>	<p>Seaweed farming is highly vulnerable to fluctuations in the global market. The intervention did not carry out a global value chain assessment or detailed</p>

	assessment of climate change impacts. These could have provided insights into the economic feasibility and sustainability of the intervention, especially with regards to supporting the livelihoods of local women, who predominantly engage in seaweed farming. In addition, alternative scenarios and options need to be explored going forward to identify the most suitable, sustainable and economically viable solution in the specific context.
Criterion 5: NbS are based on inclusive, transparent and empowering governance processes	Co-management approaches were applied in marine conservation areas. These involved the government and local communities, often with international support. They demonstrated the willingness of the Government of Zanzibar to implement blue growth strategies that are inclusive of local communities and aim to build a sustainable future. The need to further increase and improve the participation of women and aquaculture farmers in decision-making, to enhance transparency and to provide access to information, was highlighted. There are also opportunities to enhance cooperation across jurisdictional boundaries.
Criterion 6: NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	This criterion was deemed to be insufficiently addressed by the intervention. While there was a reported willingness from the Government of Zanzibar to consider relevant trade-offs, the limits of these trade-offs and associated safeguards were not clarified. Existing cost-benefit analyses have not yet considered environmental aspects that would trigger corrective action. While provisions on the rights, usage of and access to marine and coastal resources for mariculture are in place, further information on how this is applied in practice is required. By completing the self-assessment under the IUCN Global Standard for Nature-based Solutions™, it was possible to make concrete recommendations on how to improve the balancing of trade-offs, while ensuring the sustainability of the intervention.
Criterion 7: NbS are managed adaptively, based on evidence	The Government of Zanzibar put in place a blue growth strategy, which considers the challenges of seaweed farming, including related sustainability concerns. However, there is as yet no evidence of a formal mechanism to monitor and evaluate interventions on a regular basis to determine adaptive management responses.
Criterion 8: NbS are sustainable and mainstreamed within an appropriate jurisdictional context	Since the 1980s, the Government of Zanzibar encouraged multi-use marine protected zones, which were included in relevant sectoral laws and policies. A blue growth strategy and regulations support seaweed farming practices and the achievement of global targets. The means by which lessons learned are captured and communicated have been highlighted as an area for improvement.

(Source: Table developed by the authors of this report based on the IUCN Global Standard for Nature-based Solutions™ self-assessment results for this case study)

Lessons learned:

Taking corrective action. The IUCN Global Standard for Nature-based Solutions™ served as an important tool to reflect on Nature-based Solution design, implementation and monitoring challenges. It provided insights into areas that require corrective action, the collection of additional evidence and means of verification and involvement of local stakeholders. In this manner, the self-assessment results will inform future work on aquaculture and seaweed farming in Zanzibar (and elsewhere) and help improve intervention design, implementation and monitoring frameworks.

Reviewing the understanding of the NbS criteria and indicators. Several rounds of discussions, guided by IUCN expert reviewers, were held on the rationale and means of verification provided per indicator. These revealed that the criteria were sometimes understood and interpreted differently by different people, impacting the assigned rating. This demonstrated the complexities associated with assessing whether an intervention can be considered a Nature-based Solution and the need for thorough and guided consideration of each indicator.

Continued engagement. A new agenda of research and development work has emerged, including dialogues around NbS criteria and indicators with stakeholders in Zanzibar and local communities. This could contribute to a future roadmap for Zanzibar and a framework for regular self-evaluation.

4 Summary of results

First, case studies offer important opportunities for exchange of experiences, reflection on different approaches applied in different contexts as well as lessons learned with regards to opportunities, challenges and needed corrective actions. The agreed documentation framework and resulting prototype database of case studies based on the criteria of the IUCN Global Standard for Nature-based Solutions™ and elements from the *PANORAMA: solutions for a healthy planet* case study database, greatly support the analysis and comparability of experiences by offering common and robust parameters for benchmarking interventions.⁵

Second, there is tremendous strength in inclusive governance and open, transparent and participatory approaches that draw on local and/or traditional knowledge, engage Indigenous people, local communities and traditionally under-represented groups, such as women and youth. As illustrated in the Guatemala and Zanzibar cases, women in particular can benefit from enhanced opportunities, social status and income generated through NbS, when the design accounts for their role and inherent gender gaps.

Third, scale is an important success factor. Small-scale, time-bound, pilot and project-based interventions often fail to address the full complexity of societal challenges and rarely produce the biodiversity and human wellbeing outcomes expected from the NbS.

Finally, an enabling institutional, legal and policy environment provides the backbone for the implementation of and investments in NbS by making nature an ally in addressing societal challenges. Supportive, clear and coherent legal and policy frameworks can further enhance and facilitate coordination across relevant sectors and actors as well as protect the rights of affected and vulnerable communities that benefit directly or indirectly from an intervention.

⁵ More reflections on the benefits of the prototype database see CCICED Special Policy Study: Value Assessment of Nature-based Solutions, reference [11]

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