Slow-Onset Processes in Oceans and Coastal Zones

What are Challenges and Opportunities for International (Development) Cooperation?

Follow up to the Expert Dialogue | 23.11.2021

Organised by GIZ Global Programme on Risk Assessment and Management for Adaptation to Climate Change (Loss and Damage)

Imprint & Acknowledgement

Imprint

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Disclaimer

GIZ is responsible for the contents of this presentation in general. In selected cases (see indication on pages), the content was taken from the presentations made available by the respective speaker or is based on contributions made during the dialogue. Further contents have been derived from the panel discussion.

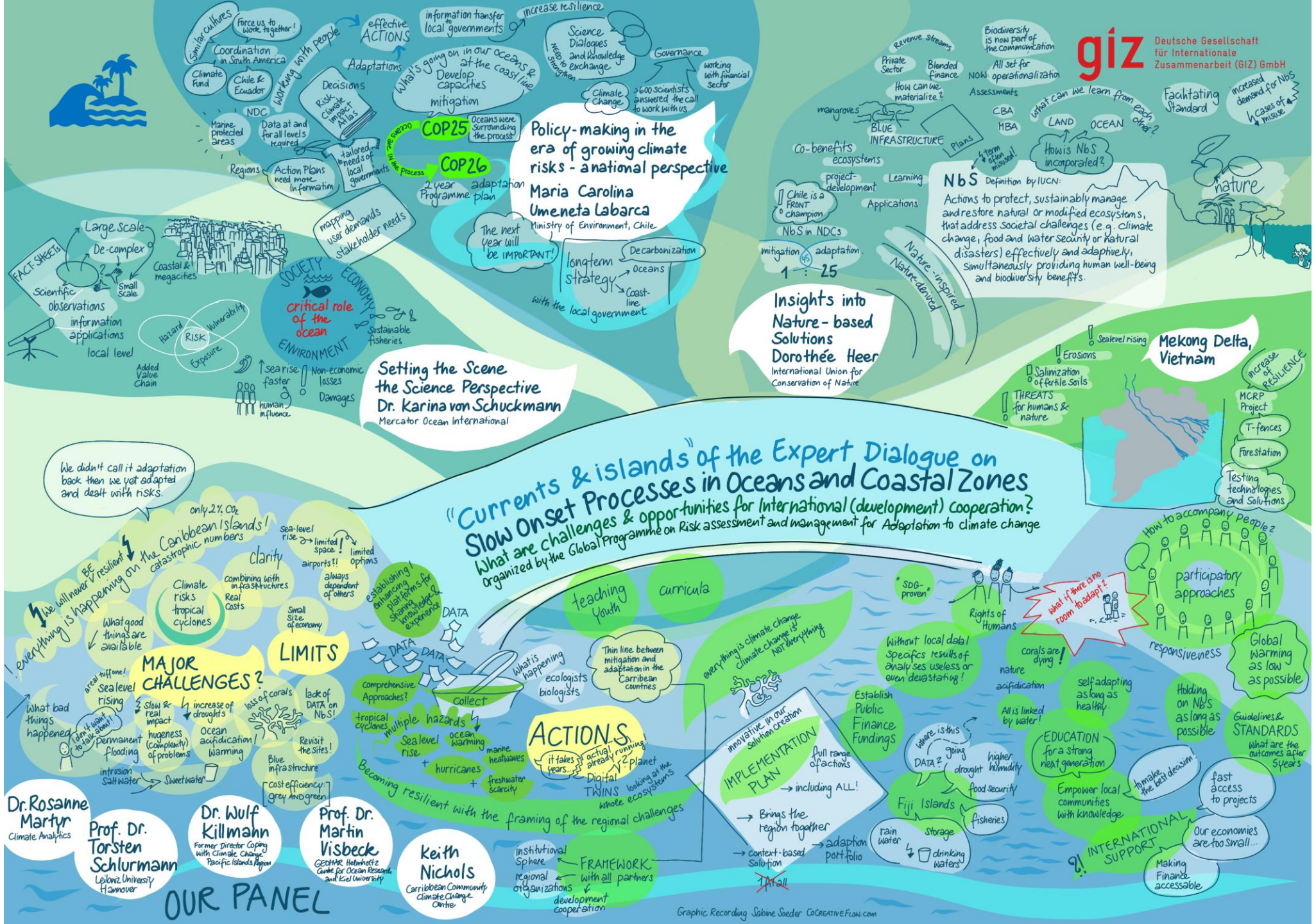
Table of Content

Further readings are provided throughout the presentation - Watch out for links!

For a summarising overview of the expert dialogue, read the brief!

Special: the UN Ocean Decade - Prof. Dr. Martin Visbeck

Graphic Recording of the Expert Dialogue



Climate risks in ocean and coastal zones

How do slow-onset processes affect coastal communities?

Slow-onset processes

“Slow onset events, as initially introduced by the Cancun Agreement (COP16), refer to the risks and impacts associated with: increasing temperatures; desertification; loss of biodiversity; land and forest degradation; glacial retreat and related impacts; ocean acidification; sea level rise; and salinization.” (UNFCCC, 2018)

The term slow-onset events is increasingly considered inaccurate since phenomena such as desertification or the loss of biodiversity are gradual changes rather than events that have a discrete beginning and end (van der Geest & van den Berg, 2021).

In our work, the term **slow-onset processes (SOP)** is used and understood to include processes that unfold **gradually over longer time periods**, for instance decades or centuries, and occur **at different spatial extents** up to and including the global, while the magnitude of change can accelerate over time, potentially triggered and magnified by climate change.

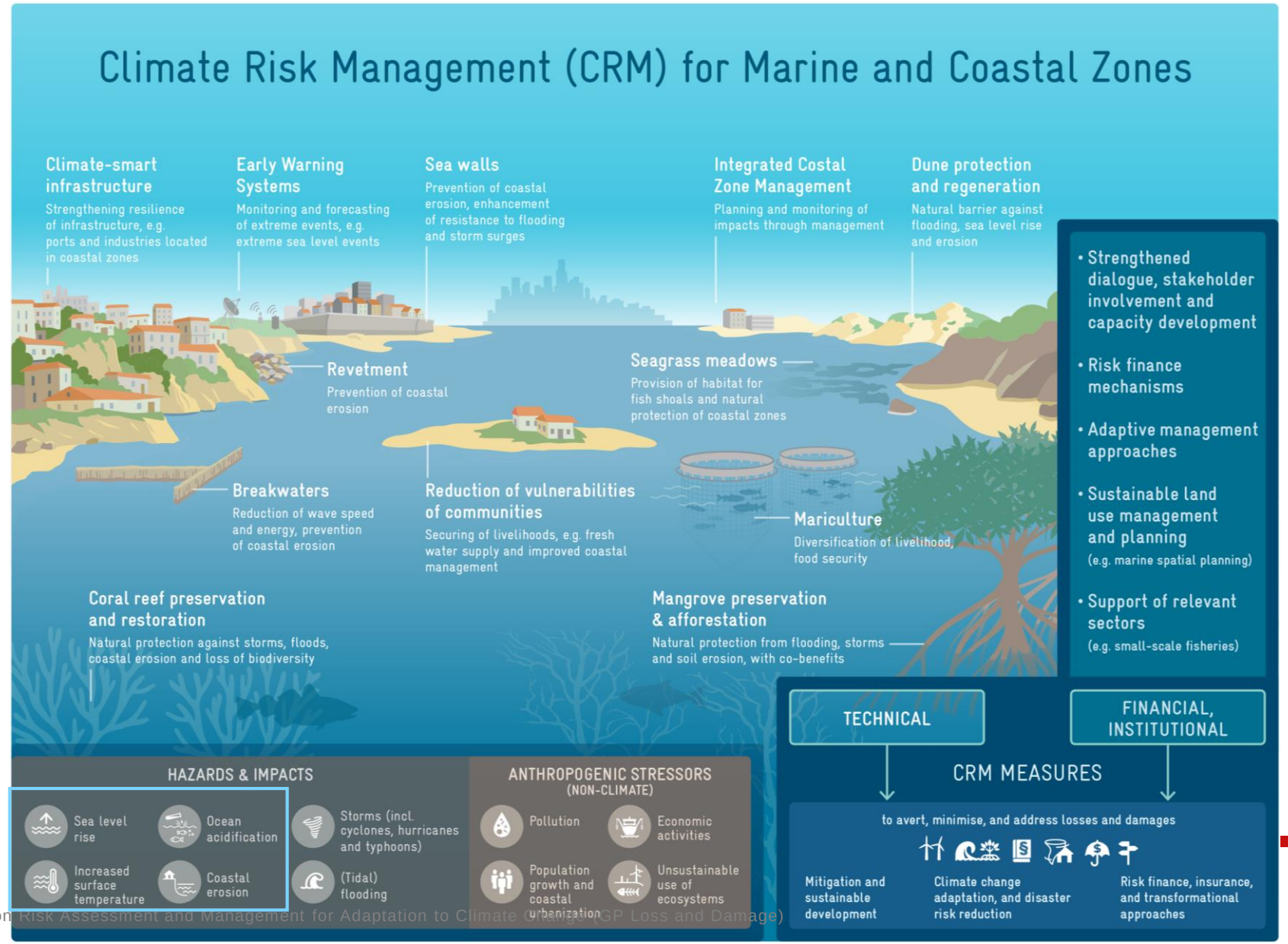
*For details on the interrelations between SOP and Extreme Weather Events (EWE), Compound Risk and Cascading Effects see: GIZ, 2021 (**Concept Paper**)*

Coastal climate hazards and impacts

Climate Risk Management (CRM) for Marine and Coastal Zones:

climate risks affect the ocean, coasts, populations and ecosystems in different ways (see following pages for more details).

CRM provides options to address risk comprehensively. Measures can be categorised into i) technical and ii) financial and institutional. This figure gives an overview on different measures that can be implemented as stand-alone or combined as part of an integrated approach.



SOP →

Coastal societies & their dependency on the ocean & coastal environments

Coasts are of particular importance to people all over the world. In order to provide humans with food, fisheries as well as coastal aquaculture and mariculture are taking place in their adjacent water bodies around the globe (Costello et al., 2019).

Moreover, coasts and oceans are **highly important routes of transportation** that enable trade and represent a substantial location for renewable energy. They are favourite destinations of the global tourism industry and a source of well-being and cultural values (IPCC, 2019).

Consequently, coasts are a massive power of attraction as a place to live and work (UNESCO, 2017), and therefore, huge ocean economy that **generates innovation, employment and economic growth** has built up (OECD, 2016; Gaines et al., 2019).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Selected impacts of SOP on coastal societies (Loss and Damage)

Human and environmental health

- seawater and nutrient inundation in contiguous coasts and freshwater resources
- emergence of water-borne diseases (e.g., cholera) (IPCC, 2019)
- severe effects on marine environments due to Harmful Algal Blooms (Hallegraeff, 2016, IPCC, 2019)
- harmful effects on the human health by the contamination of seafood (Hallegraeff, 2016)
- food insecurity

Social dimensions, e.g. culture

- losses/ damages of significant location of cultural heritage (UNESCO, 2014; Reimann et al., 2018)
- abandon of home for safety reasons (Hauer et al., 2020)
- reduction of access to traditional marine resources (Weatherdon et al., 2016)
- losses and damages of cultural and aesthetic values (IPCC, 2019)
- potential of conflicts in resource utilisation between communities or countries (Pinsky et al., 2018, IPCC, 2019)

Monetary and material wealth

- fisheries as important economic sector providing employment and livelihood (FAO, 2018)
- coastal ecosystems such as beaches and coral reef assets as basis of coastal and marine tourism services are threatened (Weatherdon et al., 2016)
- losses and damages of coastal property values and coastal infrastructure (Monioudi et al., 2018)

Dr. Karina von Schuckmann
Mercator Ocean International, France

Setting the Scene: The Science Perspective

Which role does the ocean play for the Earth's climate, society and sustainable development?

Understanding the role of the ocean

“Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years.”

– IPCC, 2021

In the case of the ocean, the rate of sea level rise is faster over the last hundred years than at any time in at least the past 3000 years.

Ocean warming was greater over the past century than at any time since the ending of the last ice age.

Acidification of the open surface ocean is greater now, and has been increasing faster, than anytime in at least 26 thousand years.

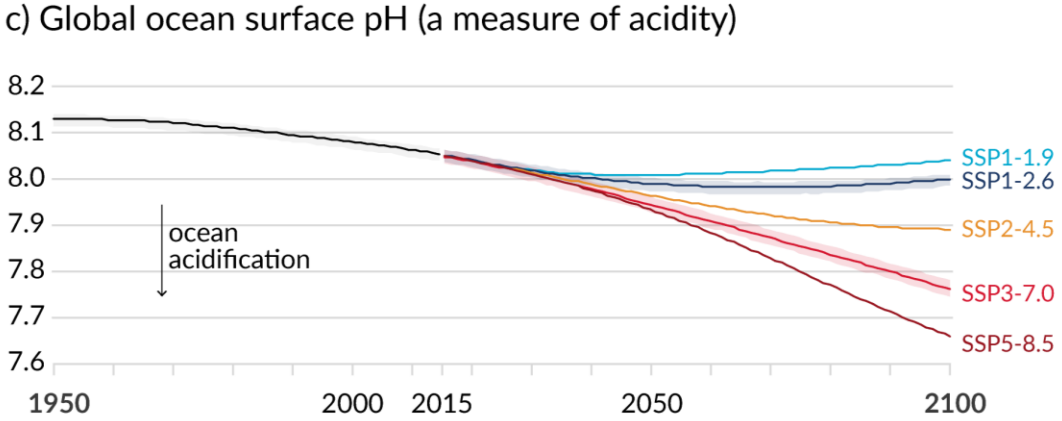


Figure SPM.8

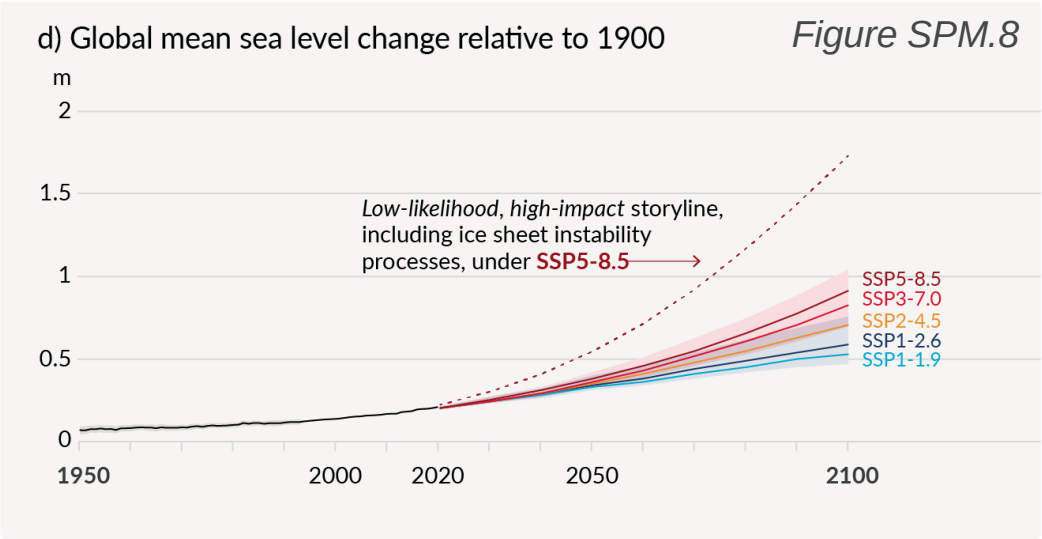


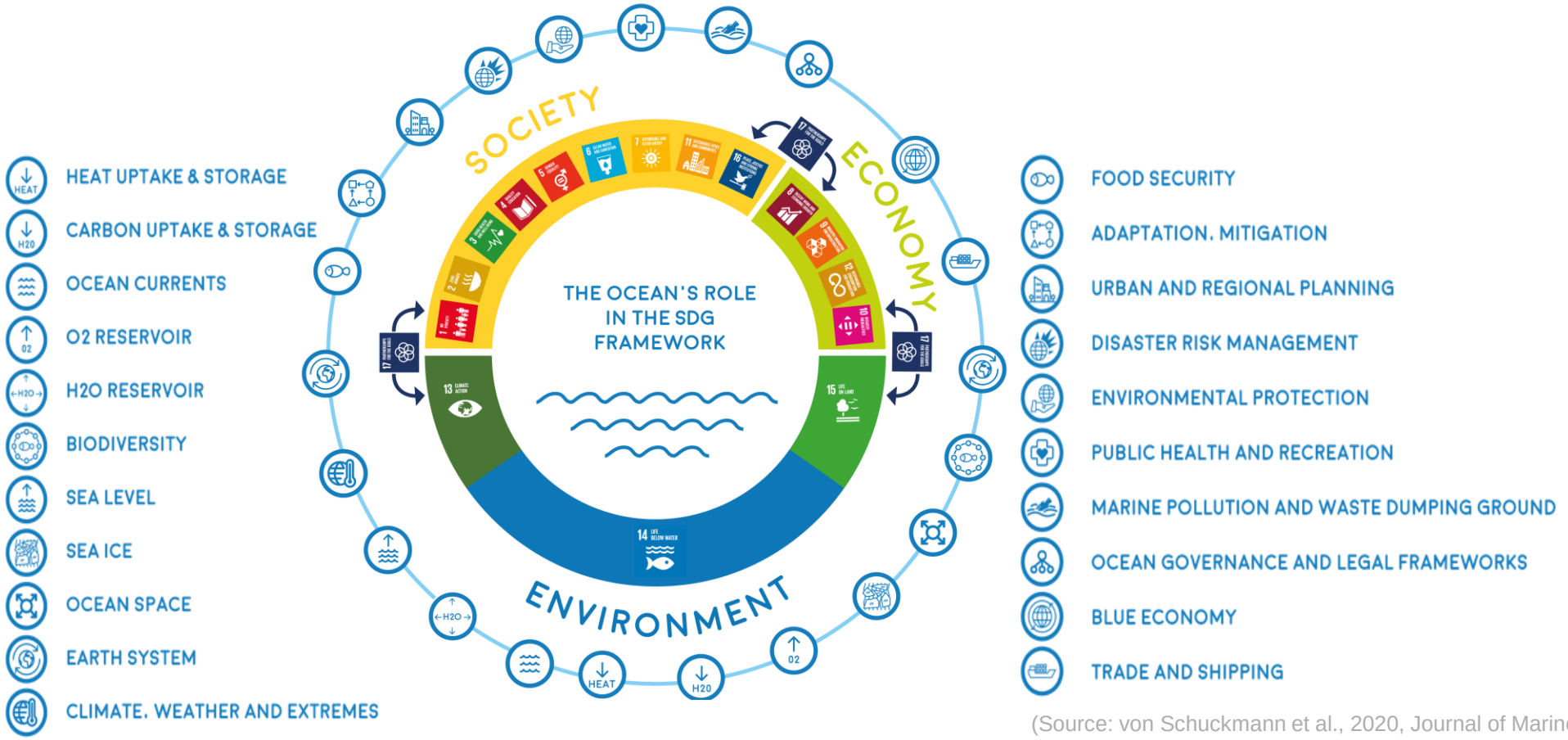
Figure SPM.8

Human influence is the main driver of these changes in the ocean set in motion by climate change.

These ocean changes are slow processes which are irreversible for hundreds to thousands of years and will continue - but these changes would be slower with lower emissions.

The ocean in the SDG framework

The world ocean drives global systems and plays a fundamental role in the SDG framework.



(Source: von Schuckmann et al., 2020, Journal of Marine Policy)

The ocean in the SDG framework

All SDGs are interconnected, and SDG14 supports the UN 2030 Agenda and the SDGs as a whole.

The Ocean offers opportunities to face causes and consequences of climate change, globally and locally, calling for a dramatic scaling up of efforts towards ambitious mitigation and adaptation

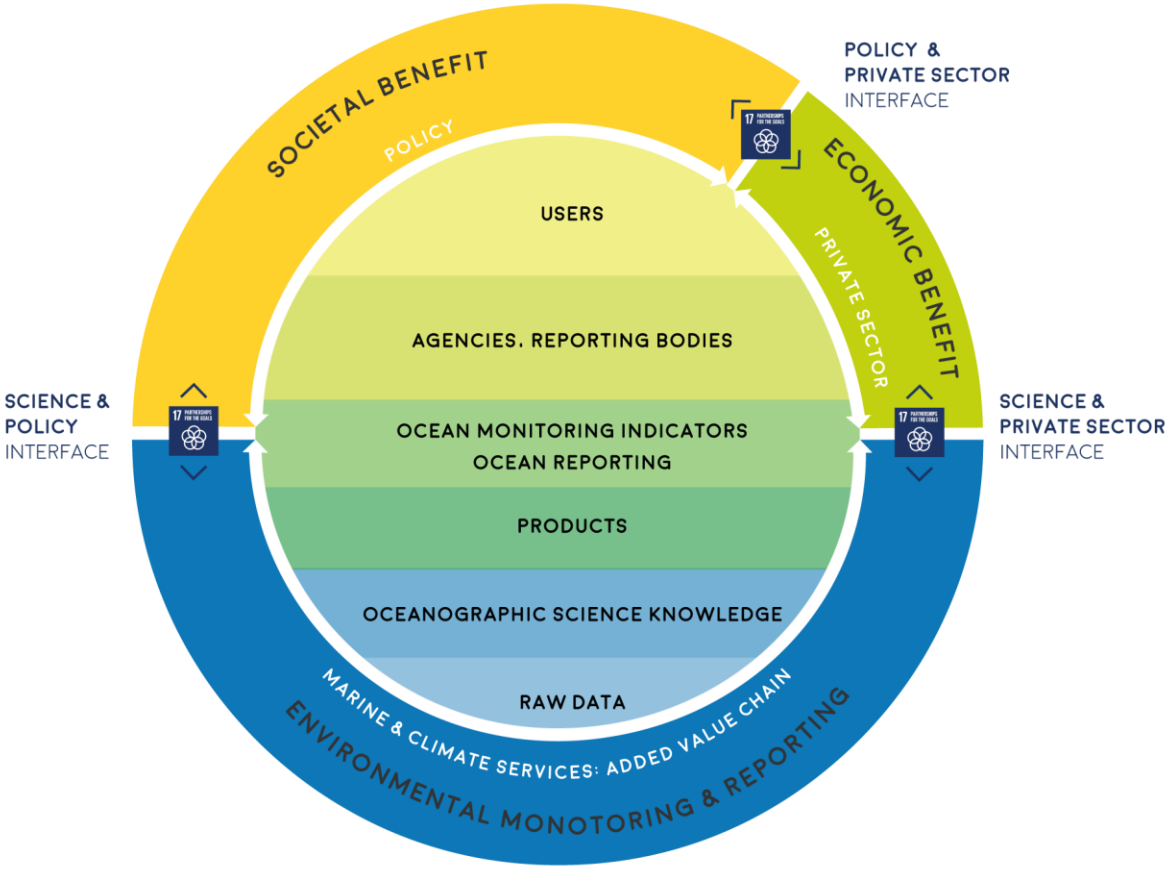
A holistic approach that embraces sustainable Ocean stewardship informed by science, data and services to support society and the economy is required to create the ‘Future We Want’.

The UN Decade of Ocean Science for Sustainable Development is an essential foundation to achieve this objective.

(Source: von Schuckmann et al., 2020, Journal of Marine Policy)

Added value chain for science-based data

How to achieve knowledge transfer across the interfaces?



(Source: von Schuckmann et al., 2020, Journal of Marine Policy)

The added-value chain

- core of Ocean and climate services
- connects raw products and oceanographic science knowledge to high-quality data products, and indicators.
- can provide the evidence basis for agencies and reporting bodies, decision makers, other stakeholders and the public, yielding societal and economic benefit

Global partnerships under SDG 17 at the science policy & science/private interface support the optimized use of environmental information through the added-value chain.

*The full publication can be found **here**.*

Climate-related risks

SOCIETY

ECONOMY

ENVIRONMENT

Risk from climate change-related effects:

(1) environmental hazards triggered by climate change,
(2) exposure of humans, infrastructure and ecosystems to those hazards, and
(3) systems' vulnerabilities

Addressing the different risk components involves assessing and selecting options for policy and action.

Such decision-making entails evaluation of the effectiveness, efficiency, efficacy, and acceptance of actions.

Source: IPCC SROCC, 2019

Policy, management and governance instruments require sustainable Ocean stewardship informed by best available Ocean science, data and services.

Risk to coastal megacities from sea-level rise

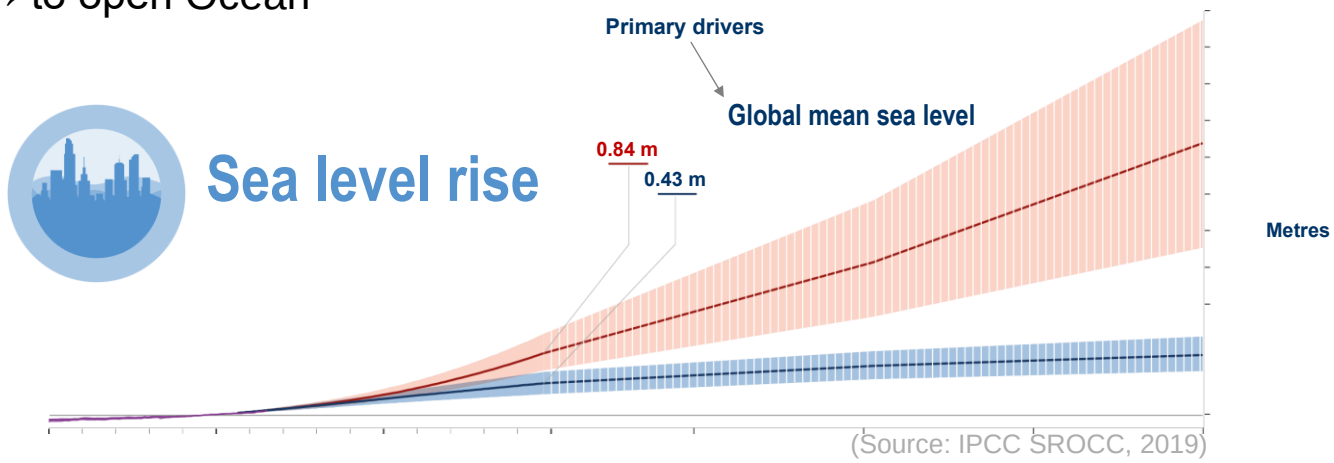
SOCIETY | ECONOMY | ENVIRONMENT

To meet the challenges of rising seas, **robust urban planning** requires

an **understanding of how urban expansion is impacted by climate change, sea-level rise and changing boundaries.**

Extending boundaries:
- from urban → to rural,
- from river, delta, coastal zones & territorial seas → to open Ocean

based on best available science, data and services.



(Source: IPCC SROCC, 2019)

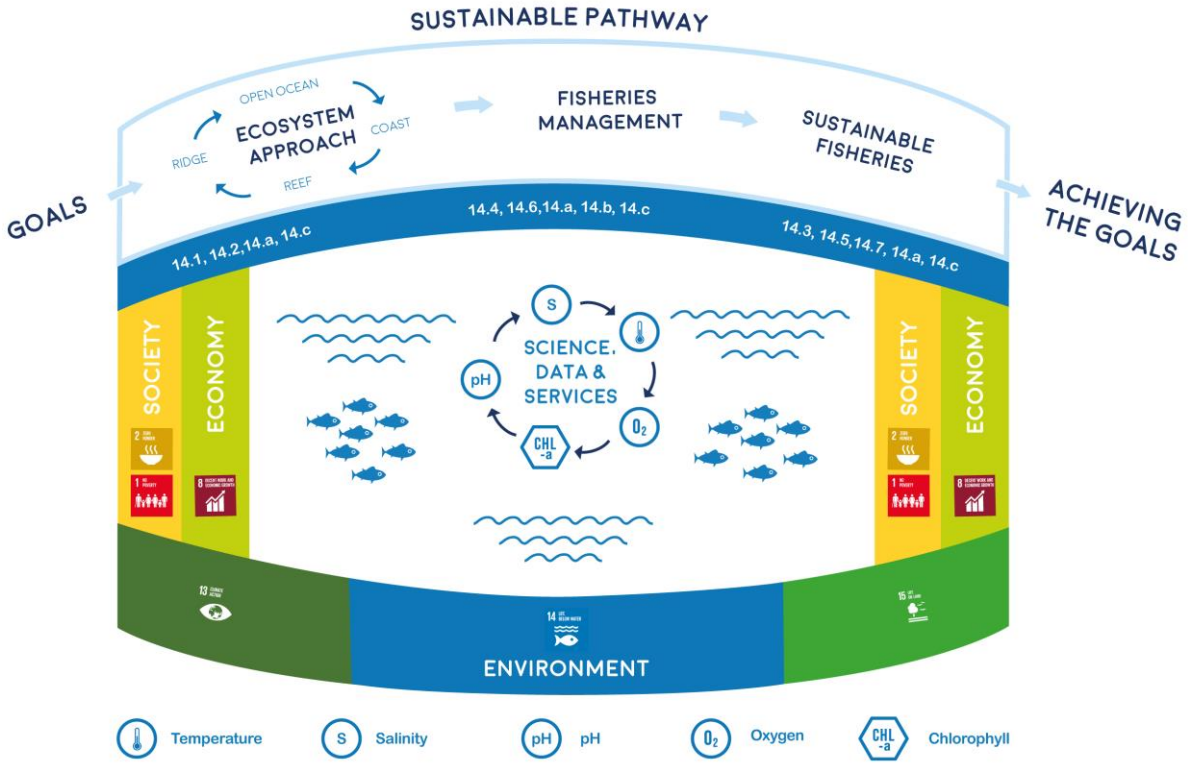
Risk to coastal economies

SOCIETY | **ECONOMY** | ENVIRONMENT

The combined use of environmental **Essential Variables** can support a holistic ecosystem approach to substantially improve fisheries management and support the development of sustainable fisheries.

In this example, the environmental variables are key to inform the sustainable stewardship required to meet the SDG targets.

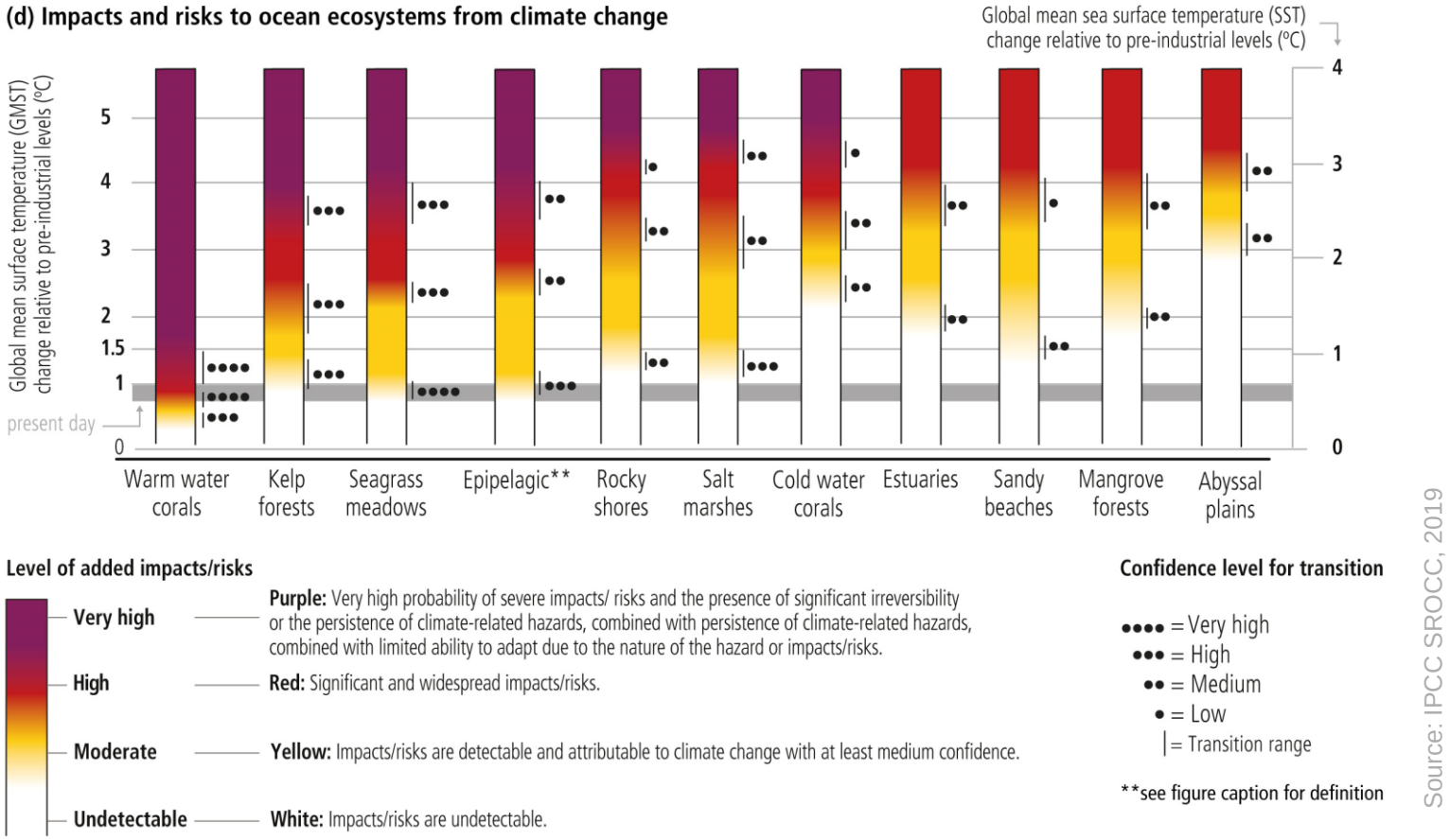
Sustainable fisheries will support a sustainable blue economy that simultaneously embraces environmental stewardship to support society and sustainable economy.



(Source: von Schuckmann et al., 2020, Journal of Marine Policy)

Risk to coastal environment

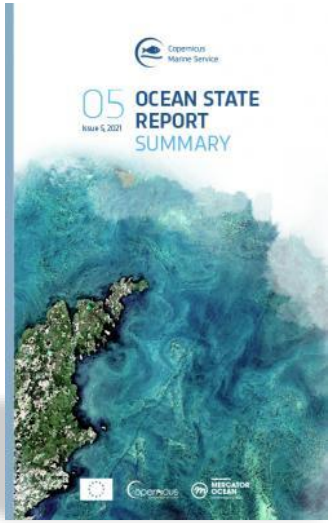
SOCIETY | ECONOMY | **ENVIRONMENT**



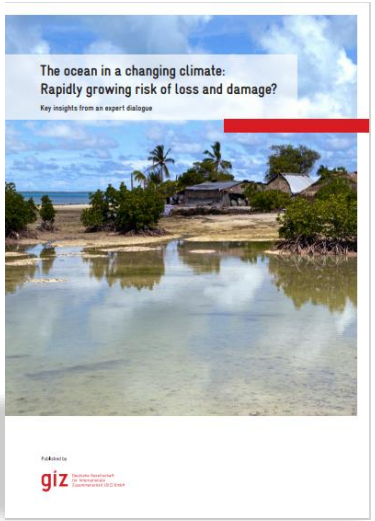
Source: IPCC SROCC, 2019

Further readings

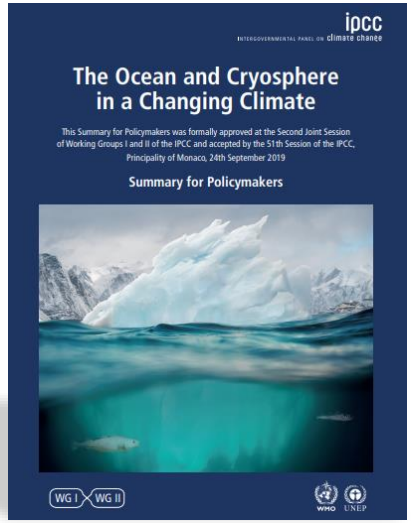
For more information and detailed insights, please refer to these publications:



Ocean State Report 2021



Report ED GP L&D 2021



IPCC SROCC 2019

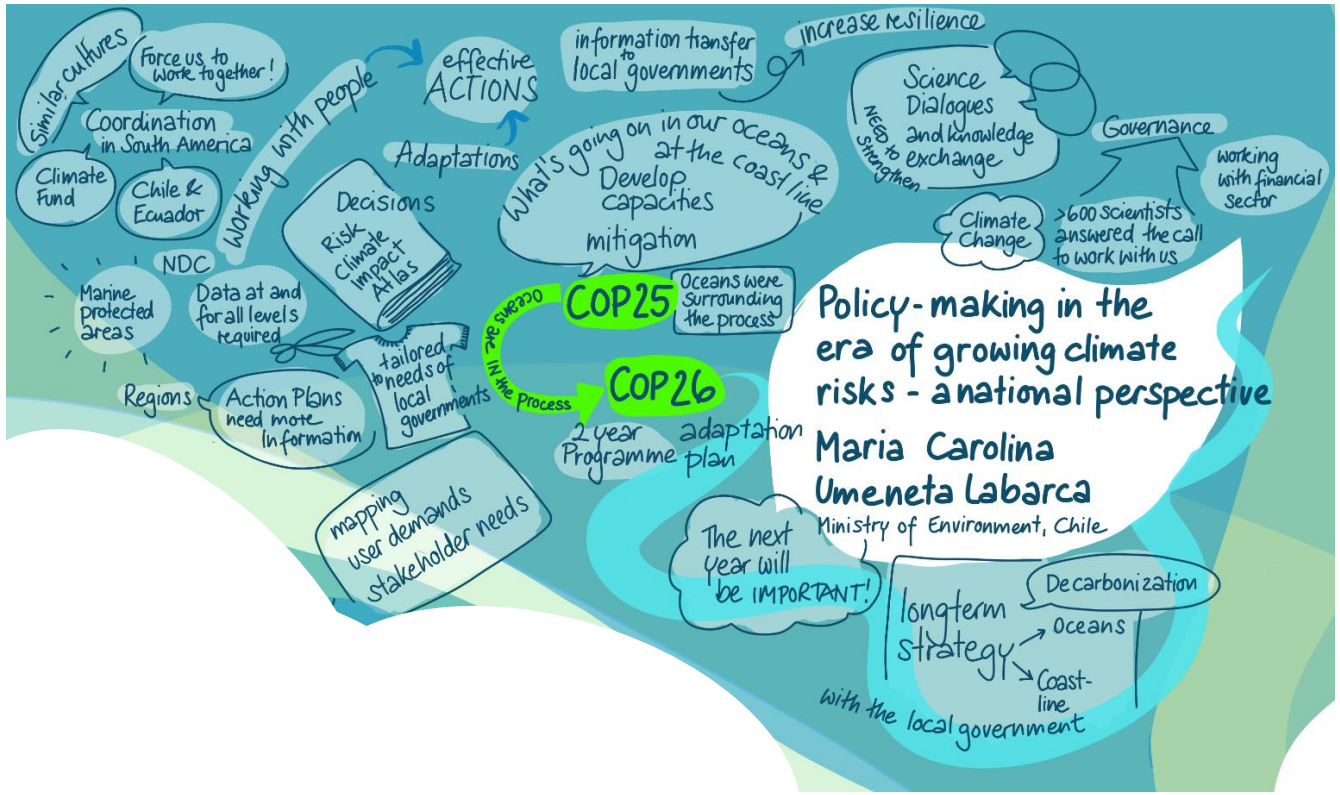
María Carolina Urmeneta Labarca,
Head of Climate Change Office at the
Ministry of the Environment, Chile

Policy-making in the era of growing climate risks -
a national perspective

How can governance structures from national to local level address risks from SOPs?

Chile‘s climate policy

The diversity of aspects in the context of climate policy-making:



- Oceans now in the COP process, not only surrounding it
- Chile:
  - long-term strategy includes particular chapters on ocean and coasts
  - NDC with adaptation commitments

- Increases in adaptive capacities needed as are strengthened local capacities with access to information and data

Dorothée Herr,
Manager of Ocean and Climate Change
Global Marine and Polar Programme, IUCN

Insights into Nature-based Solutions (NbS)

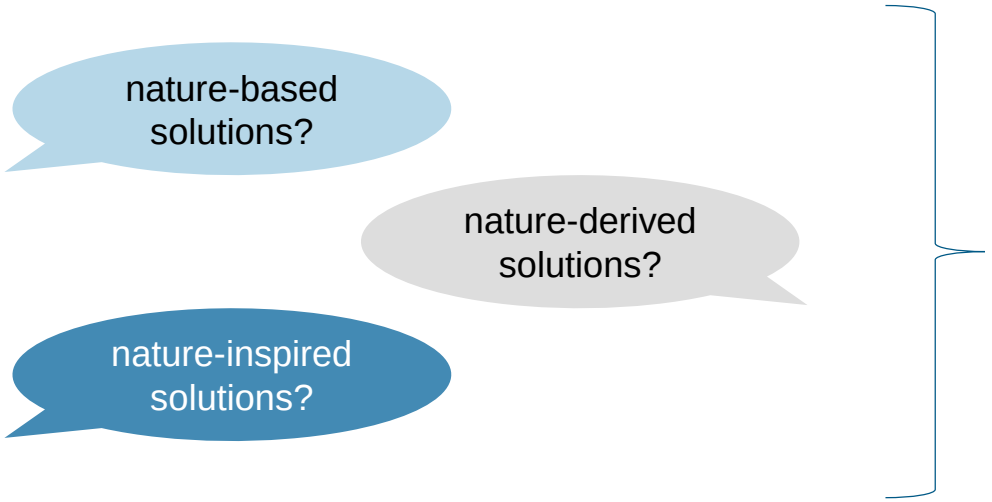
How could NbS benefit in the context of adaptation?

What are nature-based solutions?

Nature-based solutions are ...

actions to protect, sustainably manage and restore natural or modified ecosystems, that address societal challenges (e.g., climate change, food and water security or natural disasters) effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits

(according to IUCN)



Natue based solutions differ from nature-derived solutions and nature-inspired solutions.

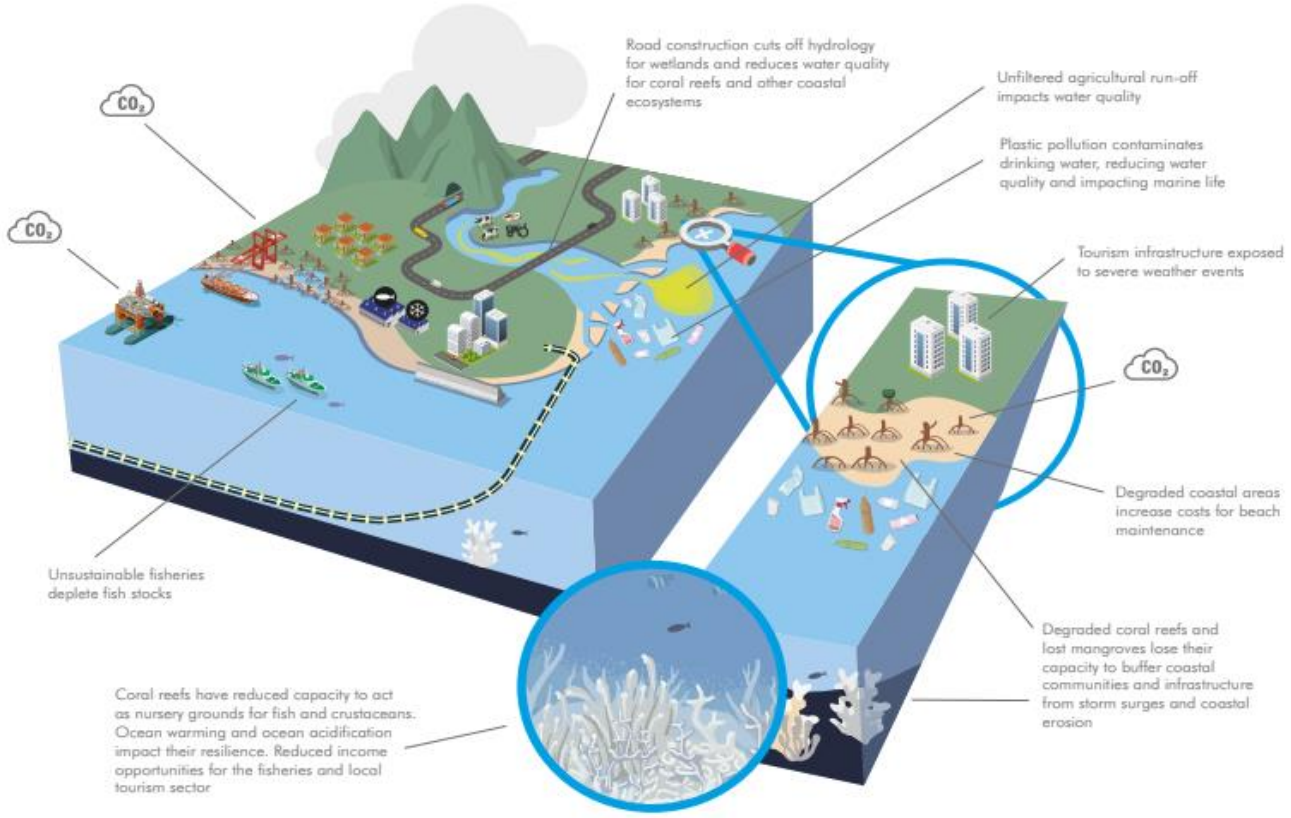
Please note that there is **no universally valid fixed definition** for the term “nature-based solutions“ which is why a differentiated approach is required

The **IUCN global standard** for NbS is comprised of eight criteria and their associated indicators:

1) societal challenges, 2) design of scale, 3) biodiversity net-gain,
4) economic feasibility, 5) inclusive governance, 6) balance trade-offs,
7) adaptive management, 8) mainstreaming & sustainability

Coastal Infrastructure

without NbS



(Source: IUCN, 2020)

Examples:

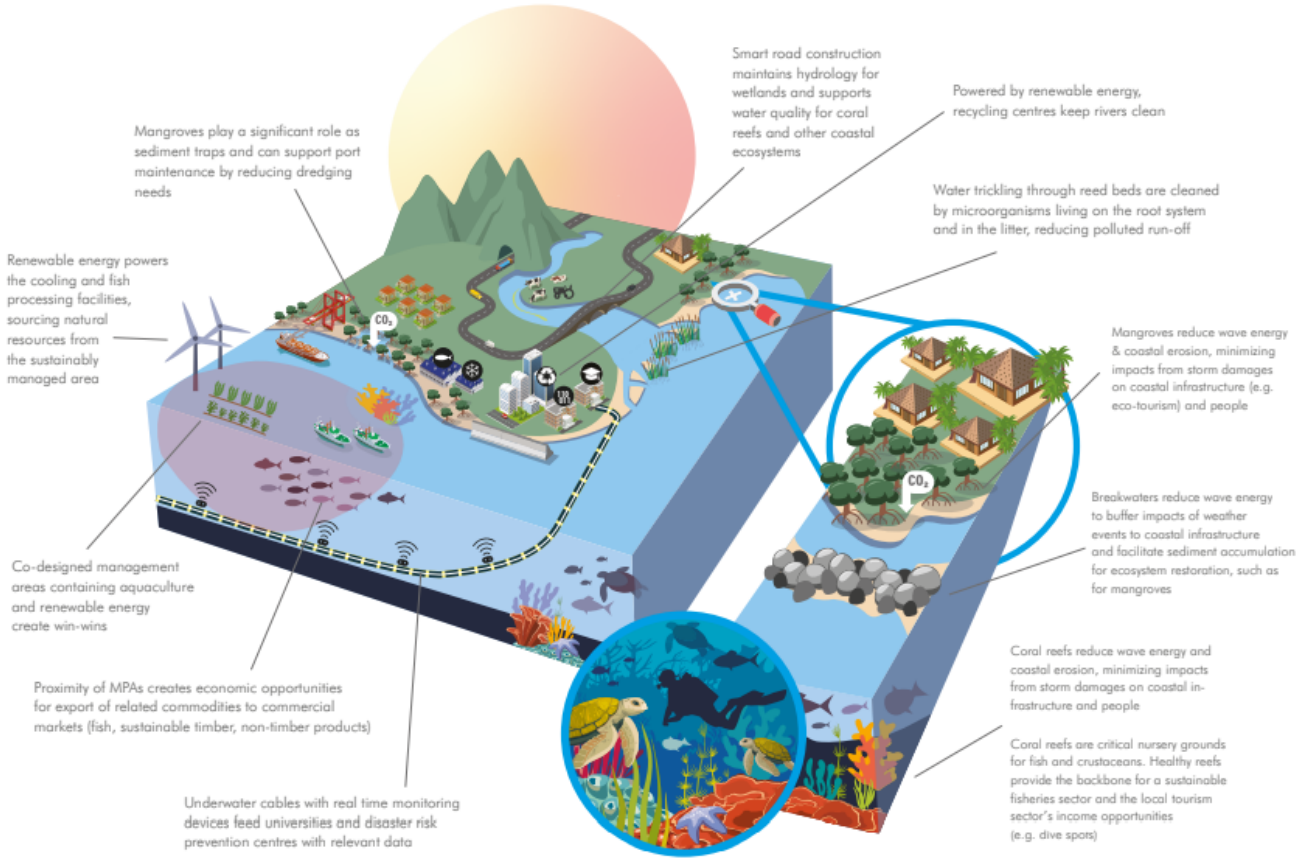
- infrastructure such as roads leading to interruption of hydrology for wetlands
- reduction of water quality for coral reefs and other ecosystems
- unfiltered runoff from agricultural land
- plastic pollution
- overfishing
- land degradation

→ ***decreased resilience***

→ ***climate risk > economic value***

Coastal Infrastructure

with NbS (Blue Infrastructure)



(Source: IUCN, 2020)

Examples:

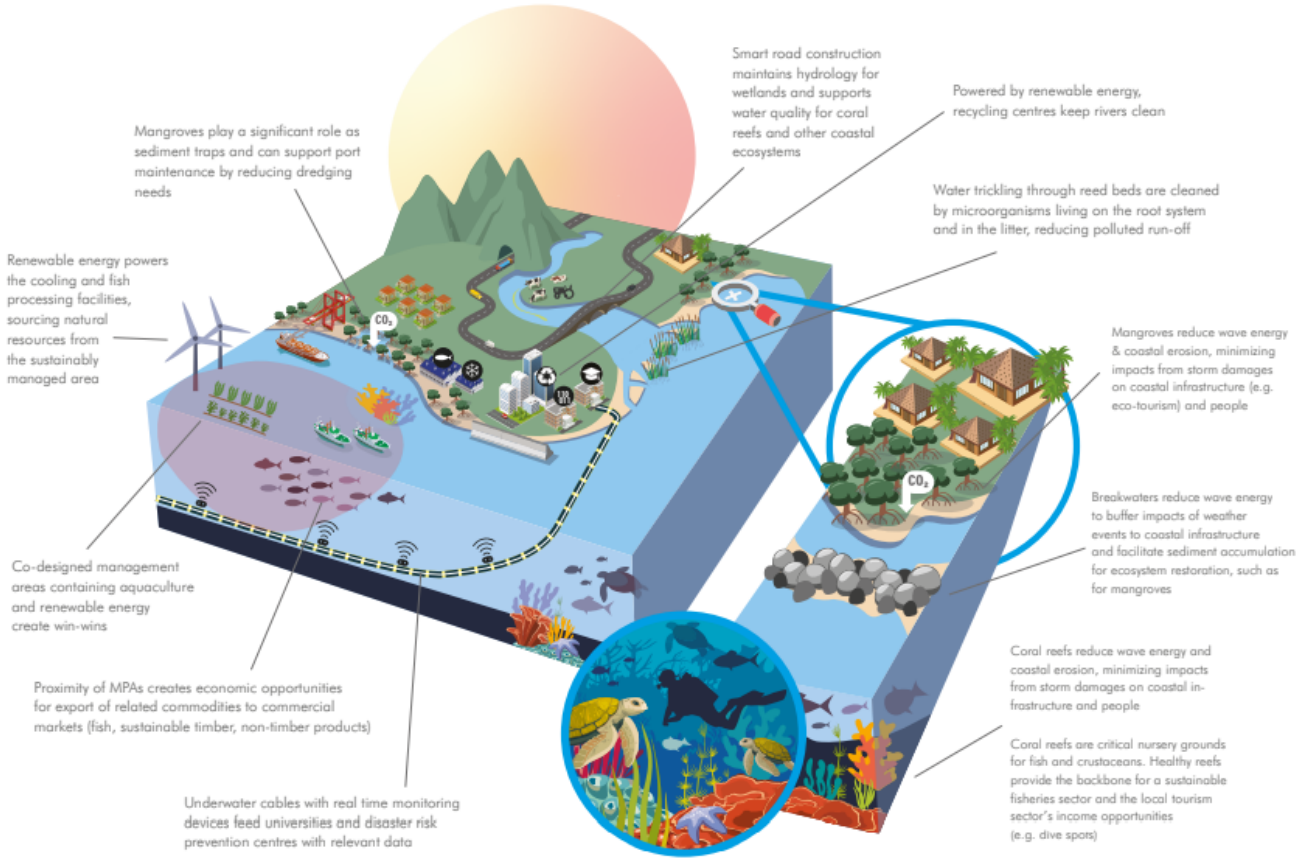
- mangroves functioning as sediment traps, reducing wave energy and coastal erosion
- breakwaters for reduction of wave energy, accumulation of sediment, restoration of ecosystems
- conservation and restoration of coral reefs
- climate-smart infrastructure
- integration of renewable energy
- materialize nature-based solutions and ecosystem conservation

→ ***increased resilience***

→ ***economic value > climate risk***

Coastal Infrastructure

with NbS (Blue Infrastructure)

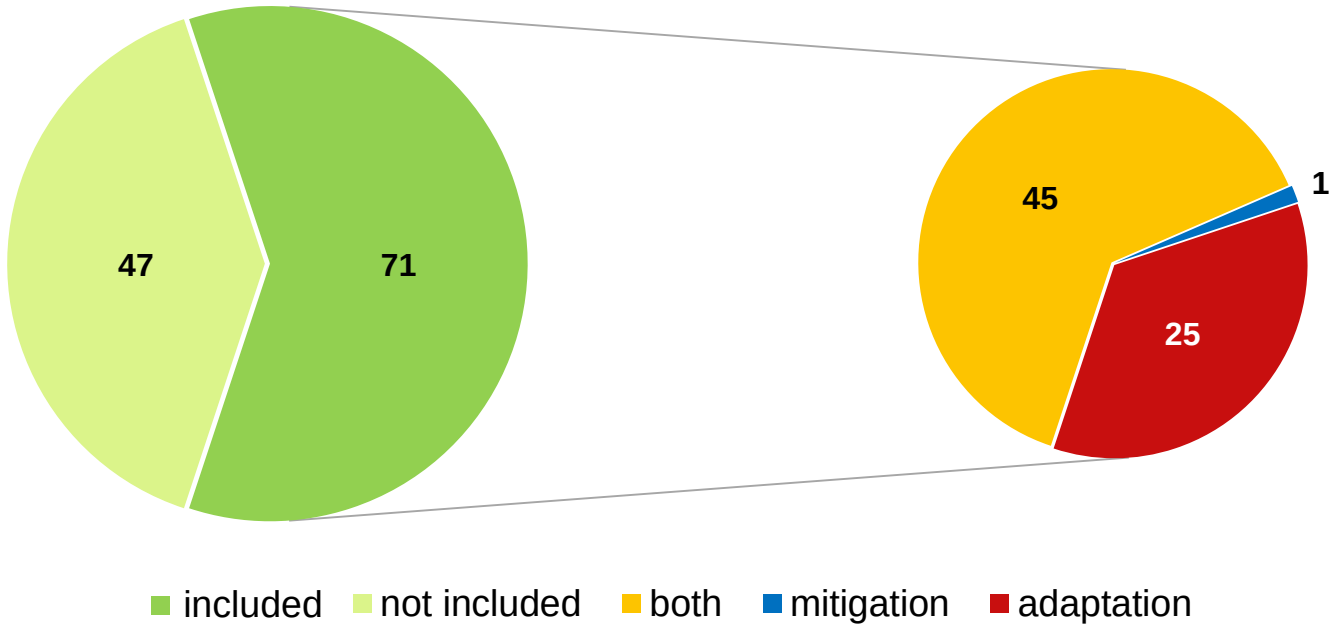


(Source: IUCN, 2020)

Further reading:

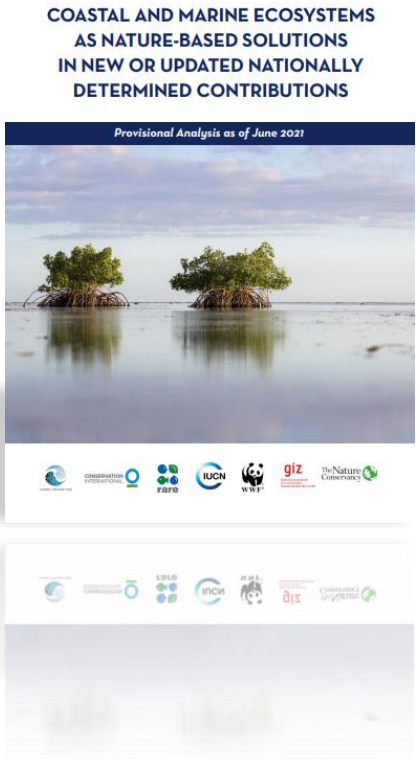
NbS in Nationally determined contributions

Frequency of NbS included in NDCs (up to 21 Oct 2021, 118 NDCs have been analysed)



(Source: Lecerf et al. 2021)

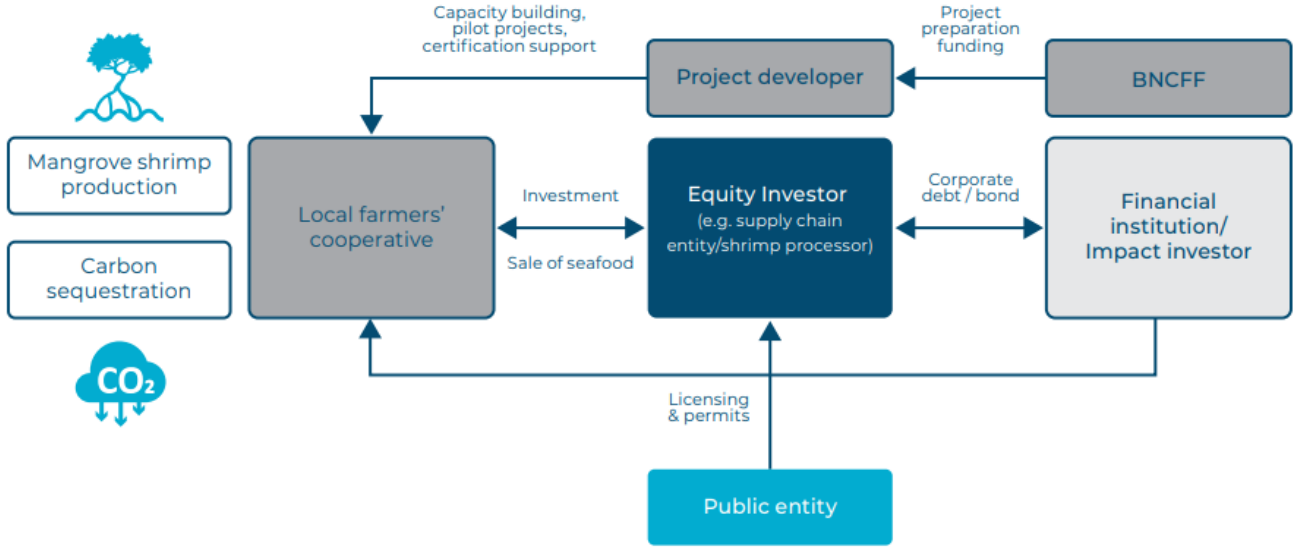
Further reading: NbS in NDCs



Innovative / blended finance

Blue Natural Capital Financing Facility (BNCFF)

Innovative finance example for the case of sustainable shrimp farming and mangrove restoration:



*Learn about more examples with BNCFF's **Blue Print Series***

*and with BNCFF's **Podcasts** on ocean investments*

(Source: www.bluenaturalcapital.org)

Ocean – Climate Change Nexus: UNFCCC COP26 outcomes

Recognizing **the interlinked global crises of climate change and biodiversity loss, and the critical role of protecting, conserving and restoring nature and ecosystems in delivering benefits for climate adaptation and mitigation**, while ensuring social and environmental safeguards.

5. Notes with serious concern the findings from the contribution of Working Group I to the Intergovernmental Panel on Climate Change Sixth Assessment Report, including **that climate and weather extremes** and their adverse impacts on people and nature will continue to increase with every additional increment of rising temperatures → Cop27 // opportunities to inform and include

60. Invites **the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and workplans** and to report on these activities within the existing
reporting processes, as appropriate → opportunities to inform and include

61. Also invites the Chair of the Subsidiary Body for Scientific and Technological Advice **to hold an annual dialogue**, starting at the fifty-sixth session of the Subsidiary Body for Scientific and Technological Advice (June 2022), to strengthen ocean-based action and to prepare an informal summary report thereon and make it available to the Conference of the Parties at its subsequent session → opportunities to inform and include

Practice Perspective

Looking at concrete measures: Which impacts, and challenges are to be tackled in affected regions?

The Mekongdelta in Vietnam

Christoph Klinnert,
Mekong Delta Climate Resilience Programme (MCRP)

17 million people

> 10 000 animal species

} living along the river and sea shores

Prominant climate change-induced slow-onset processes and impacts:

coastal erosion

sea level rise

- → shoreline retreat up to 50 m/ year (land degradation)
- → decline of mangrove forests (forest degradation)
- → affecting the irrigation channels of agricultural land (salinisation)
- → 38% of Mekongdelta could be lost to the sea by 2100 (land subsidence)

Learn more about GIZ's work in the Mekong Delta at [Climate Resilience in the Mekong Delta - YouTube]

CRM in practice

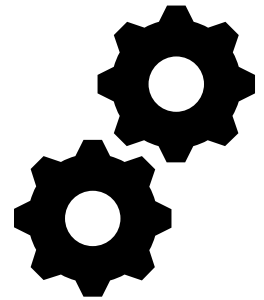
Mekong Delta Climate Resilience Programme (MCRP)

The Mekong Delta Climate Resilience Programme (MCRP) is a development cooperation programme co-financed by the Governments of Germany, Switzerland and of Viet Nam.

MCRP is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close cooperation with the Ministry of Agriculture and Rural Development (MARD), Ministry of Construction (MOC) and the 13 Mekong Delta provinces.

MCRP's objective is to support the Vietnamese authorities on improving the climate-resilient management of natural resources in the coastal areas of the Mekong Delta to ensure sustainable development in the region.

*Learn more about the project (**here** **and** **here**).*



The South Pacific‘s Island Nations

Dr. Wulf Killmann
Former Director of “Coping with Climate Change in the Pacific Island Region”-Programme

sea level rise

increased ocean acidification

marine heatwaves

coastal erosion

- Severe impact on arable land → salinisation of land → food and water insecurity
- Increase of frequency and intensity of cyclones
- Loss of low-lying atoll-countries → loss of freshwater land → salt intrusion → now people depend on rainwater as only freshwater
- Example of no rain for 6 months for some pacific islands → drinking water needed to be delivered by plane
- Ocean acidification/ ocean warming → loss of corals, damage to marine ecosystems, loss of fisheries, food insecurity due to loss of protein intake (fish)

Climate change in Oceania is one topic that is currently being addressed in an **exhibition of the Ethnologisches Museum Berlin**.

CRM in practice

Coping with Climate Change in the Pacific Island Region (CCCPIR)

The CCCPIR programme, implemented by GIZ between 2009 and 2021, aimed at advancing mitigation and adaptation to climate change in various sectors in all 14 Pacific island states and Timor-Leste.
CCCPIR supported the development of policies and strategies to prepare key sectors of the economy for anticipated climate-related events. According to demand, the project advised on agriculture, forestry, fisheries, sustainable energy, education and climate finance in the individual countries. Further, CCCPIR strengthened climate-relevant capacities of the regional organisations Pacific Islands Forum Secretariat (PIFS), Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP) and the University of the South Pacific (USP).

Learn more about the project ***here***.

Impacts achieved by the programme (selection)**:**

900 vulnerable people protected through improved coastal management

5 countries have incorporated climate change into their education system

5 countries have strengthened public financial management systems, increasing chances of accessing climate financing

Over **7500** rural people with improved fresh water supply

The Caribbean

…are…

- extensively exposed to climate-related disasters, specifically tropical cyclones, hurricanes, and floods as well as sea-level rise and coastal erosion
- susceptible to the negative impacts of climate change due to their size, location, and reliance on sectors vulnerable to changing climate patterns

	Current Climate change impact	Projected Risk at 1.5°C warming	Projected Risk at 2°C warming
Ecosystem			
Coral	Negative	• Very high	• Very high
Coastal wetlands	Negative	• High	• High
Mangrove	Negative	• Moderate	• Moderate
Human systems			
Fisheries	Negative	• High	• Very high
Tourism	Negative	• Moderate	• Moderate

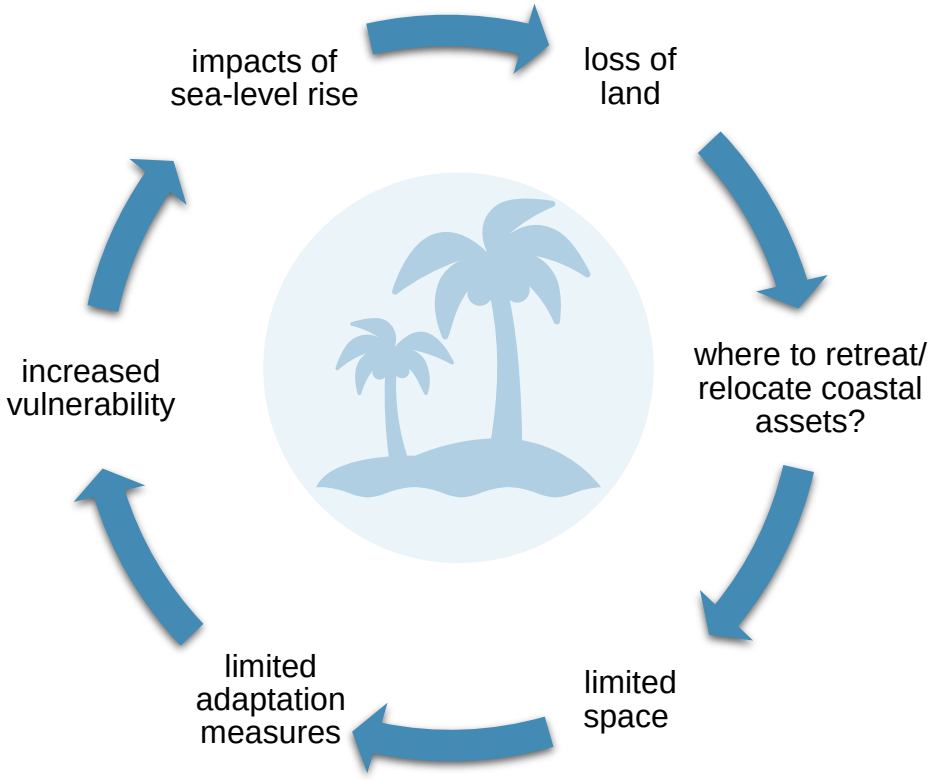
(Source: IPCC, 2019; Thomas et al., 2020)

6 Caribbean islands in top 10, all Caribbean countries in top 50 most disaster-prone countries in the world (Moody's Investors Service, 2016)

324 disasters occurred in Caribbean since 1950, killing 250,000 people and affecting more than 24 million through injury and loss of homes and livelihoods (International Monetary Fund, 2018)

Major challenges to Caribbean SIDS

Keith Nichols
Caribbean Community Climate Change Centre



(The cycle's content is based on the panel discussion)

- Constraint to Caribbean SIDS much greater since space on islands is limited
- resources to manage climate change mostly exceed countries' economies → high dependance on external resources
- critical infrastructure located on sea level, logically retreat is advisable

  → *But where and how can communities be relocated to areas which are not available?*

  → *How can resilience be achieved if the bar is constantly changing?*

Sector example: Small-scale fisheries

For more information and detailed insights, please refer to these publications:

Global Study GP

Report ED GP L&D

Regional Factsheets GP:

Pacific

Caribbean

West Africa

Innovative impulses: Potentials of CRM

How can climate risk management in ocean and coastal zones be designed and applied effectively?

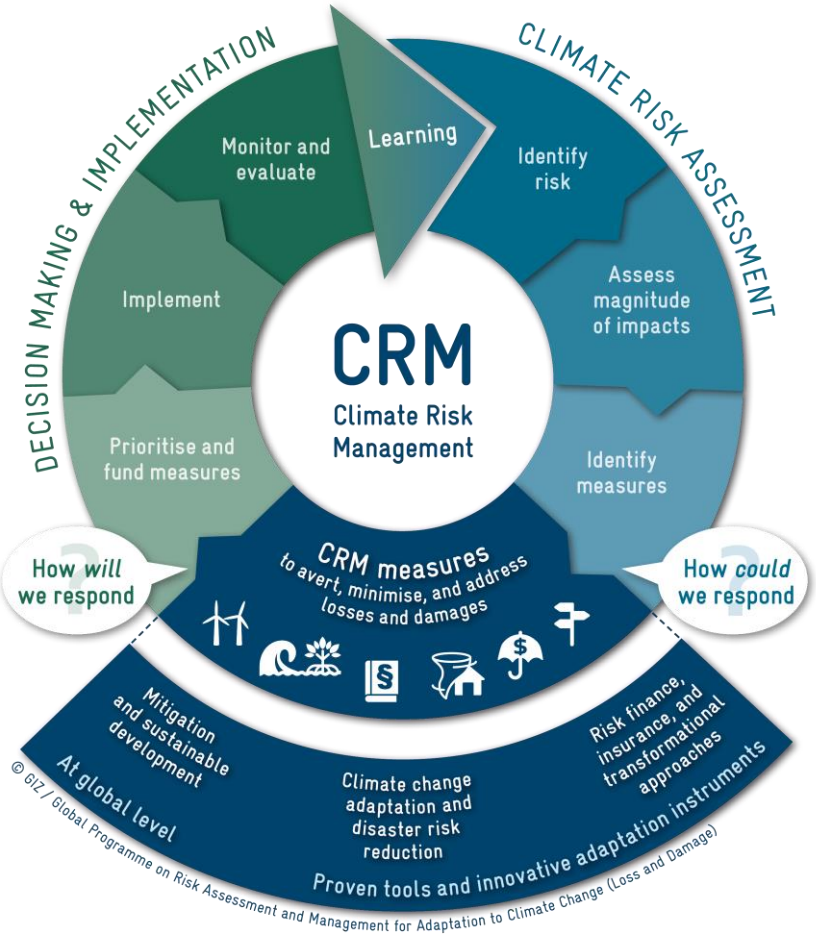
Climate Risk Management (CRM)

Initially, a Comprehensive Risk Management framework, a multi-pronged approach was developed by the United Nations Executive Committee of the **Warsaw International Mechanism (WIM) for Loss and Damage** are useful mechanisms for assessing negative climate impacts, and quantifying damages averted through adaptation

Our GP L&D, supported by the German Government's Federal Ministry for Economic Cooperation and Development (BMZ), has developed a risk-based, iterative framework to guide the management of climate-related risks, considering biophysical, social, economic, non-economic, and environmental aspects.

Our CRM approach

- considers the entire spectrum of climate-related hazards and risks from short-term EWE to long-term SOP
- combines a smart mix of climate change adaptation and disaster risk reduction measures
- implies that all sectors factor risks into their plans, including considering how risks may affect action across sectors
- includes tried-and-tested measures are complemented by innovative instruments, such as climate risk insurance and social protection schemes, and transformational approaches, such as livelihood diversification.



Mitigation – role and potentials

Mitigation to limit warming

Mitigating climate change by drastically reducing anthropogenic greenhouse gas emissions is imperative. In that way, consequences (e.g., sea temperature increase, coral bleaching, algal blooms, etc.) for marine and coastal ecosystems, biodiversity and eventually people can be reduced or averted. Preserving natural carbon sinks complements mitigation activities.

Mitigation capacities of the ocean and coastal ecosystems

The ocean and coasts have the potential to limit global temperature rise, in line with the goals of the Paris Agreement. Ocean-based interventions could close up to 21% of the emissions gap by 2050. To date, about 30% of anthropogenic emissions of the greenhouse gas carbon dioxide (CO_2) and more than 90% of the access atmospheric heat have been taken up, leading to higher water temperatures, stronger ocean stratification, deoxygenation, rising sea levels and ocean acidification.

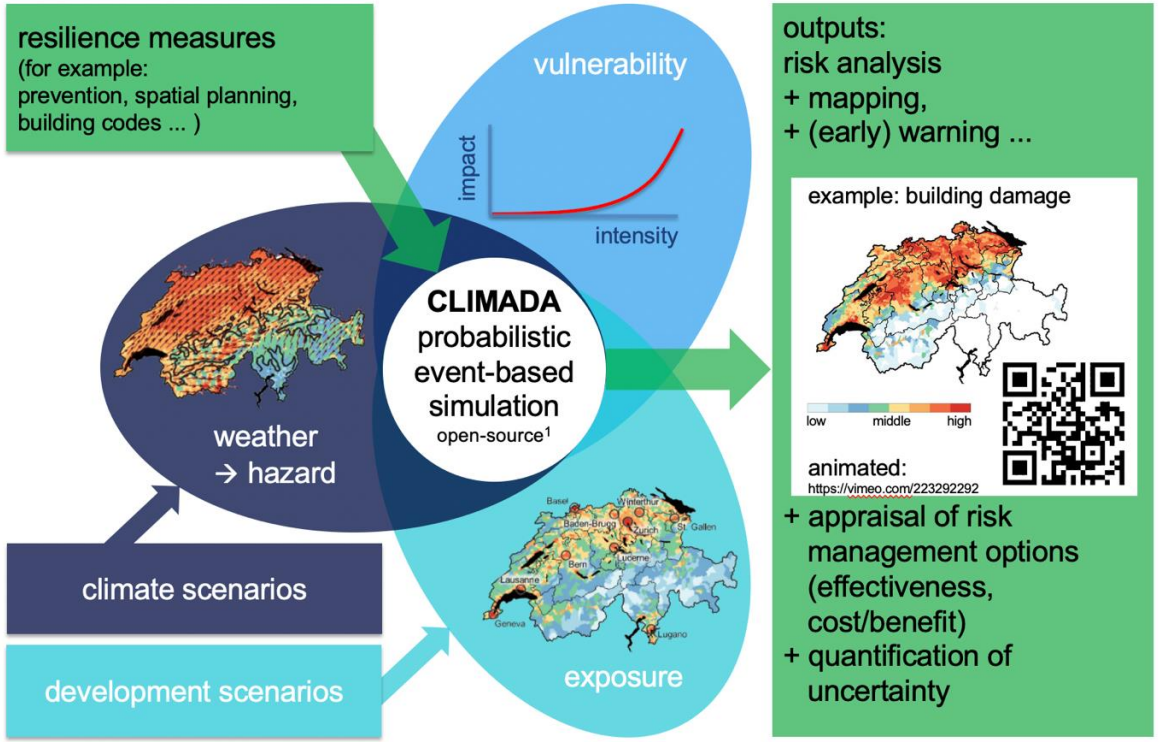
In addition to the ocean itself, coastal ecosystems (including mangrove forests and seagrass meadows) have the potential to take up and store carbon – if not degraded or destroyed. Marine nature-based solutions, like the conservation of mangrove forests and other coastal ecosystems, sequester CO_2 and at the same time are vital for coastal communities, providing food and resources as well as coastal protection and erosion reduction.

Suggested reading: **The Ocean as a Solution to Climte Change** by Hoegh-Guldberg et al. (2019) commissioned by the High Level Panel for A Sustainable Ocean

CRM in Coastal LDCs and SIDS

Dr. Rosanne Martyr
Coastal Hazards and Adaptation Scientist,
Climate Analytics

Assessment of adaptation potentials with CLIMADA *(CLIMate ADAptation)*



(Source: https://wcr.ethz.ch/research/climada.html)

The approach

- CLIMADA is an open-source natural catastrophe model that can be applied to estimate climate risk and quantify the averted (economic) damages / potential of adaptation measures now and in the future,
- combination of grey infrastructure with NbS → decision makers can apply a whole portfolio of measures and derive information about cost-benefits,
- the model is written in the programming language Python, allowing users to customise inputs, incorporating a variety of input data from different open-access sources.

Assessment of adaptation potentials with CLIMADA

In the joint study with Climate Analytics, a methodology based on CLIMADA to assess potentials of adaptation measures was developed. The objective includes to shed light on the question of how decision-makers can be supported in identifying suitable solutions and effective measures to address losses and damages caused by climate-related events, in this case tropical cyclones in the Caribbean.

CLIMADA can help decision-makers to answer relevant questions:

What are potential adaptation measures to deal with the risk, and how effective are these measures in terms of damage reduction?

- grey infrastructure such as seawalls and levees
- nature-based solutions (high benefit–cost ratios)
- improved infrastructure through retrofitting of houses
- risk transfer through insurance

→ For some islands and in some scenarios a mix of adaptation measures have the potential to avert damages from tropical cyclones. For other islands, an adaptation gap may still be incurred

What are the expected benefits and costs?

- identification of regions which are at particular risk
- identification of adaptation measures to be prioritised
- illustration of the change in benefits over time

→ For nature-based measures: reductions to damages are high relative to other measures; however, the negative impacts of climate change subsequently reduce the measures' effectiveness.

If you are curious to learn more on this topic, don't miss to have a read: **study** and **factsheet** *(available soon)*.

Portfolio of measures

Prof. Dr. Torsten Schlurmann
Ludwig-Franzius-Institute for Hydraulic, Estuarine and Coastal Engineering

From:

single tools/ stand-alone measures (e.g., purely grey/ green infrastructure)

“one-size-approach fits all”

‘Resetting of coastal engineers’ minds in progress
→ needed in all minds

To:

comprehensive assessment of local adaptation demands & appropriate mix of tools addressing given context required locally

built upon proven approaches and benefit from peer-learning

Find more details in the paper:


nature COMMUNICATIONS

ARTICLE

OPEN

Considering socio-political framings when analyzing coastal climate change effects can prevent maldevelopment on small islands

Grey vs. Green infrastructure

Grey infrastructure

- has proven itself for a long time in terms of reliability, durability and investments (“Best practices” available)
- data, knowledge and experiences on grey infrastructure often available on local level (e.g., how to design a breakwater)
- expensive to build and maintain; known for side-effects on structure and functioning of ecosystems

Green infrastructure

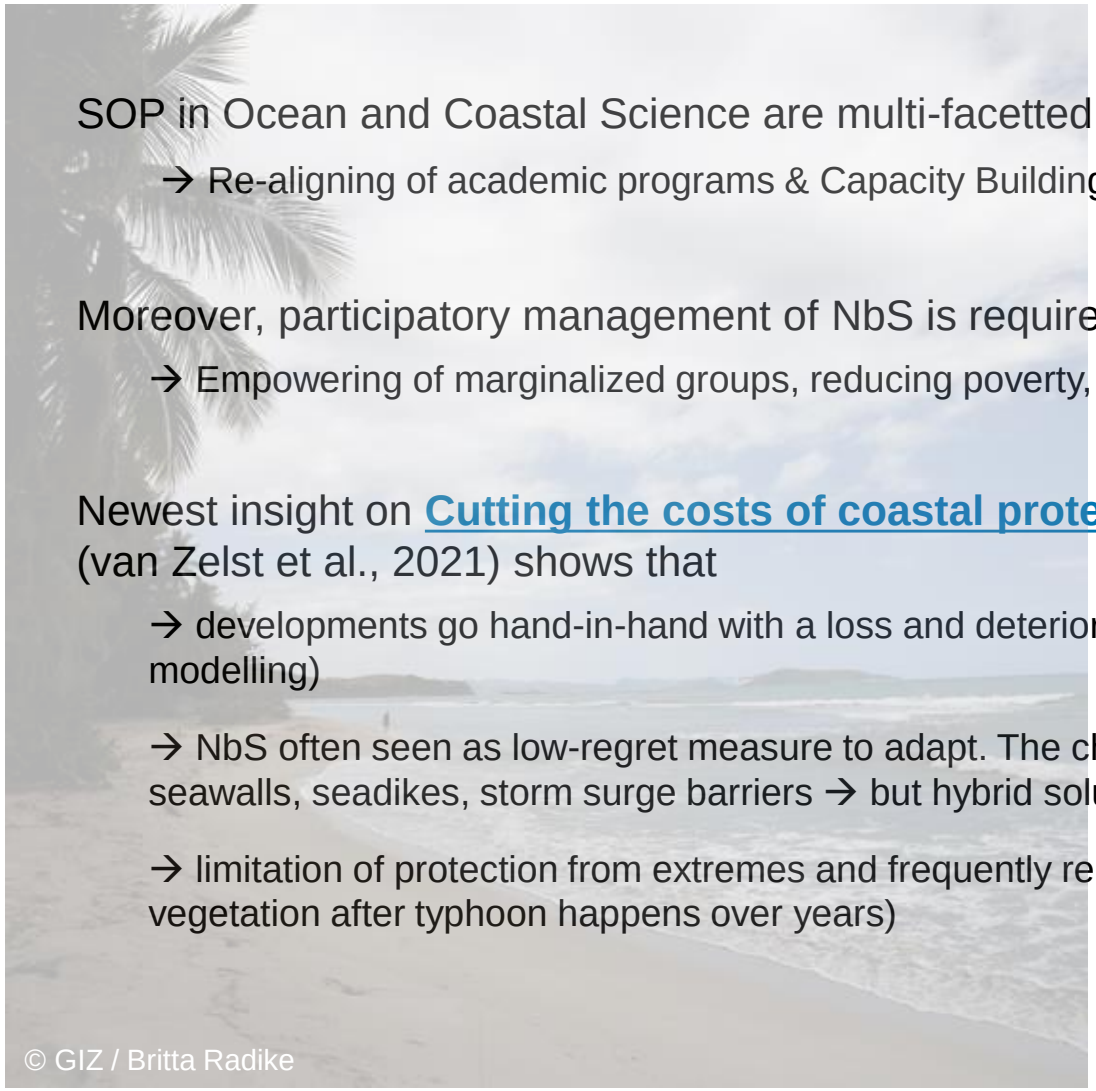
- long-term experience/ data on success of NbS still missing → monitoring and reporting of NbS up to 5-10 years after implementation necessary, since NbS change with the system over time (self-maintenance; uncontrolled self-adjustment)
- low-cost implementation and maintenance → maladaptation since it’s low-regret solution
- ecological side effects → compensation measures; NbS lack trust, social acceptance and identification

Hybrid solutions (= green + grey coastal infrastructure)

- lack of standards and expertise for hybrid infrastructure
- cost-efficency of hybrid? → co-benefits arise from NbS/ green measures
- Example: levees with different vegetation cover (leaves, roots) enhanced protection, but probably less investments needed (van Zelst et al. 2021)*

**link to paper on next slide*

Design of approaches



SOP in Ocean and Coastal Science are multi-facetted and demand for joint (research) approaches

→ Re-aligning of academic programs & Capacity Building measures

Moreover, participatory management of NbS is required:

→ Empowering of marginalized groups, reducing poverty, supporting local economies and enhancing biodiversity

Newest insight on **Cutting the costs of coastal protection by integrating vegetation in flood defences** (van Zelst et al., 2021) shows that

→ developments go hand-in-hand with a loss and deterioration of ecosystems (observation data and hydrodynamic modelling)

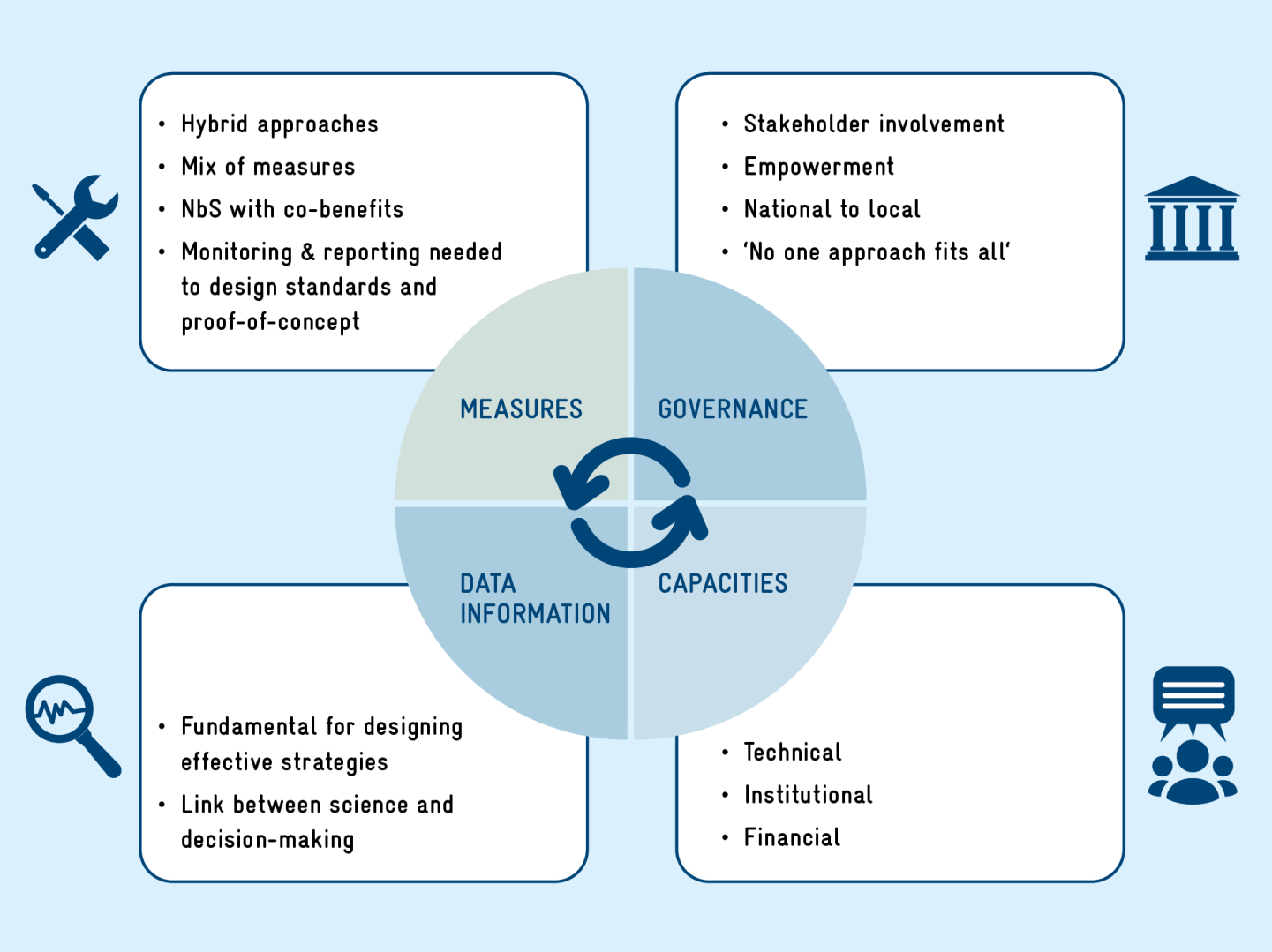
→ NbS often seen as low-regret measure to adapt. The challenge: no protection of permanent inundations in with e.g., seawalls, seadikes, storm surge barriers → but hybrid solutions offer large potentials

→ limitation of protection from extremes and frequently repeating extremes (rehabilitation of green belts / coastal vegetation after typhoon happens over years)

A call for action

What are the opportunities for international development cooperation?

Dimensions and entry points for development cooperation



(Developed based on the discussions; this figure does not claim to be all-encompasing but rather providing some out of further examples)

Globally, **650 million** people live in coastal areas **less than 10 m above sea level**, directly exposed to threats of SOP. In addition, sustainable development directly and indirectly depends on healthy oceans and coasts. The impacts of SOPs can be far-reaching, not only due to the **interconnectedness of systems** and processes.

- **Data and trends**: SOP unfold over long(er) terms and data is oftentimes not available in high, local resolutions; moreover, so-called **compound risks** need to be understood further
- **Informed decision-making**: enhanced cooperation with science and research allows to base decisions on the best available findings

- **Successful implementation of comprehensive strategies**: can be supported by the combination of measures based on context-specific assessments of risk and analyses of adaptation potentials
- **Local empowerment and participatory** elements: can be increased considerably through co-creation awareness and acceptance; furthermore, local needs, capabilities, and local knowledge will be factored in and strengthend

- **Evidence on applicability, effectiveness and impacts of measures** and strategies: needs to be generated, assessed and made available not least to promote knowledge transfer
- Identification of **synergies between international to local agendas and strategies**: have to be investigated further and applied in a systematic manner; through existing formats and networks, knowledge and experience sharing can be facilitated.

UN Decade of Ocean Science for Sustainable Development (2021-2030)

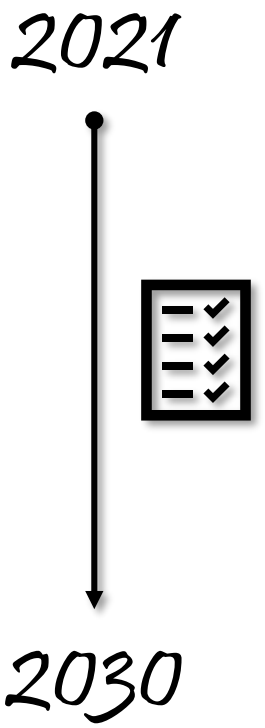
Prof. Dr. Martin Visbeck,
GEOMAR Helmholtz Center for Ocean Research and Kiel University, Germany

Vision: The science we need for the ocean we want

Mission: Transformative ocean science solutions for sustainable development, connecting people and our ocean.

Ocean Decade Challenges

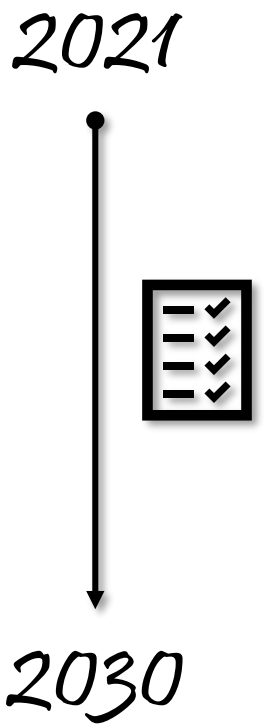
1. Understand and map land and sea-based sources of **pollutants and contaminants** and their potential impacts on human health and ocean ecosystems, and develop solutions to mitigate or remove them.
2. Understand the effects of multiple stressors on ocean ecosystems, and develop **solutions to protect, monitor, manage and restore ecosystems and their biodiversity** under changing environmental conditions, including climate.
3. Generate knowledge, support innovation, and develop solutions to optimise the role of the ocean to contribute to **sustainably feeding the world's population** under changing environmental and social conditions.
4. Generate knowledge, support innovation, and develop solutions to contribute to **equitable and sustainable development of the ocean economy** under changing environmental and social conditions.
5. Enhance understanding of the **ocean-climate nexus** and use this **understanding** to generate solutions to mitigate, adapt and build resilience to the effects of climate change, and to improve services including improved predictions and forecasts for weather, climate, and the ocean.



UN Decade of Ocean Science for Sustainable Development (2021-2030)

Ocean Decade Challenges (cont.)

6. Expand **multi-hazard warning systems** for all biological, geophysical, and weather **and** climate related ocean hazards, and mainstream community preparedness and resilience.
7. Ensure a sustainable **ocean observing system** that delivers timely data and **information** accessible to all users on the state of the ocean across all ocean basins.
8. Develop a comprehensive **digital representation of the ocean**, including a dynamic ocean map, through multi-stakeholder collaboration that provides free and open access to explore, discover, and visualize past, current, and future ocean conditions.
9. Ensure comprehensive **capacity development and equitable access to data, information, knowledge and technology** across all aspects of ocean science and for all stakeholders regardless of geography, gender, culture, or age.
10. Ensure that the multiple values of the ocean for human wellbeing, culture, and **sustainable** development are recognised and widely understood, and **identify and overcome barriers to the behaviour change** that is required for a step change in humanity's relationship with the ocean.



International Action on Oceans and Coasts

Many states, regions and communities -irrespective of their development status- which have relevant assets in coastal **zones are not ready to tackle climate risks** such as **sea level rise**. Discussions often evolve around e.g., plastic pollution rather than the major challenges of climate change. But especially slow onset processes are major hazards –to this point without a clear response to it- and depict to be one of the toughest tasks to deal with for which enhanced frameworks are required.

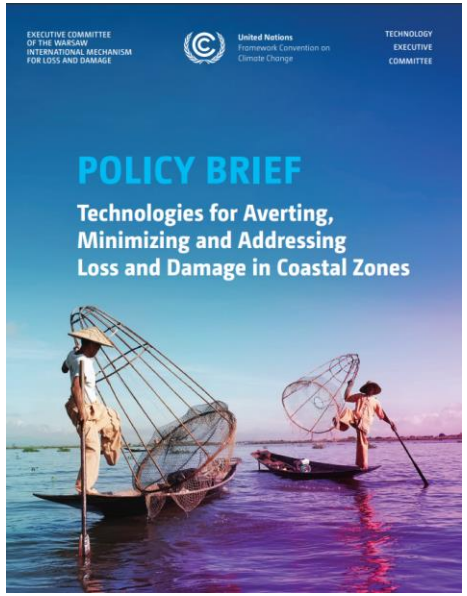
Click on the button to learn about some of the most relevant international frameworks and initiatives in the context of ocean and coasts:

2030 Agenda	United Nations Decade of Ocean Science for Sustainable Development	Sustainable Development Goals in particular SDG14
UNFCCC's Nairobi Work Programme (NWP)	Warsaw International Mechanism for Loss and Damage	Convention on Biological Diversity (CBD) and their Aichi Targets
Friends of Ocean Action	International Alliance to Combat Ocean Acidification	Ocean dialogue at UNFCCC COP

Further readings

For more information and detailed insights, please refer to these publications:

Policy Brief WIM ExCom & TEG



CRM Concept Paper GP L&D

OECD Losses and Damages from Climate Change

DIE & GIZ: Towards Sustainable Ocean Governance

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