Coast-Adapt

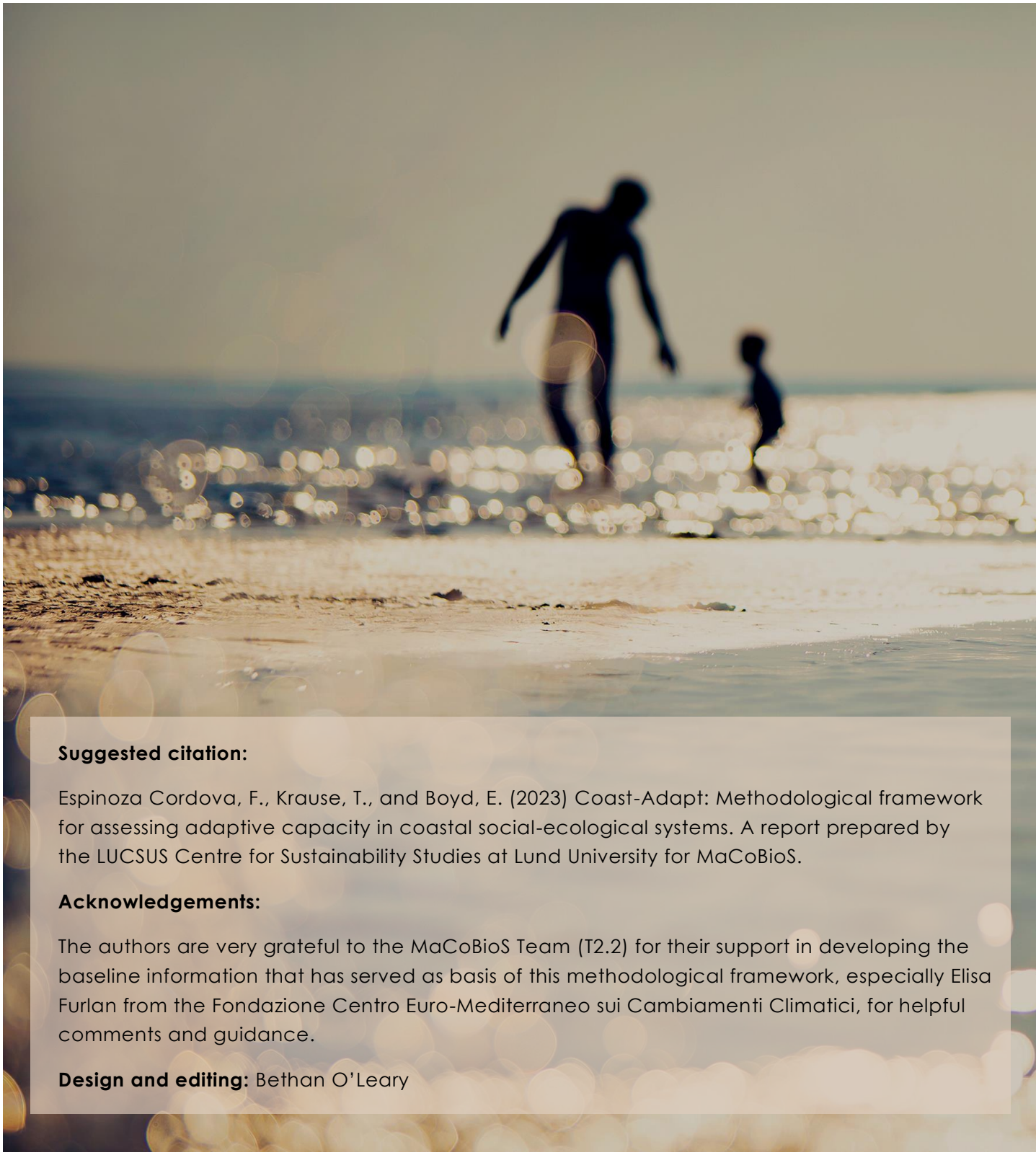
Methodological framework for assessing adaptive capacity in coastal social-ecological systems

Fabiola Espinoza Cordova

Torsten Krause

Emily Boyd

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869710



Suggested citation:

Espinoza Cordova, F., Krause, T., and Boyd, E. (2023) Coast-Adapt: Methodological framework for assessing adaptive capacity in coastal social-ecological systems. A report prepared by the LUCSUS Centre for Sustainability Studies at Lund University for MaCoBioS.

Acknowledgements:

The authors are very grateful to the MaCoBioS Team (T2.2) for their support in developing the baseline information that has served as basis of this methodological framework, especially Elisa Furlan from the Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici, for helpful comments and guidance.

Design and editing: Bethan O'Leary

COAST-ADAPT

Coast-Adapt is a set of guidelines that aid in the design and conduct of an index-based adaptive capacity assessment to evaluate coastal communities' current capacity to adapt and plan actions to support them to adapt to the effects of future change.

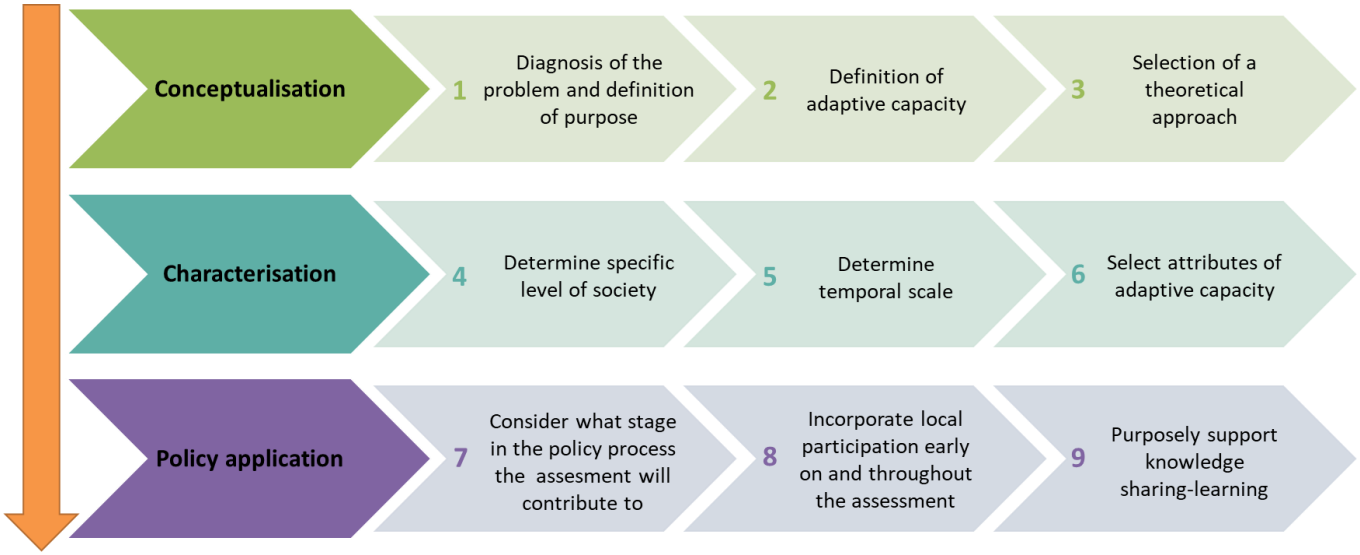
Coast-Adapt was developed by researchers at the Lund University Centre for Sustainability Studies (LUCSUS) through the EU-funded MaCoBioS project (www.macobios.eu).

KEY INFORMATION

- Coast-Adapt is a 9-step framework that provides practical guidance for how to design and conduct an index-based adaptive capacity assessment in coastal social-ecological systems. Coast-Adapt was informed by a scientific literature review of index-based adaptive capacity assessments of coastal social-ecological systems.
- Coast-Adapt is a general set of guidelines, and as such it can be adjusted to be used at all stages of decision-making regarding intervention options, including Nature-based Solutions.
- When applied, the output is a collection of qualitative and quantitative information about the capacity level of coastal communities to anticipate and respond to changes, as well as the conditions that underpin such capacity. It may be used to provide baseline information about the capability of local communities to adapt to changes, which can be useful for designing an intervention, as well as facilitating monitoring.
- To use Coast-Adapt you will need:
    - a clear conceptualisation of the problem the assessment aims to address. This requires understanding the country/regional context and the local coastal social-ecological system, as well as hazards and/or risks exacerbated by climate change, ecosystem degradation or loss, and social, economic, institutional and governance factors; and
    - awareness of the roles of different actors in the coastal social-ecological system and a clear participatory strategy to involve those actors in the design and implementation of the adaptive capacity assessment, including co-design of relevant indicators.

METHODOLOGICAL FRAMEWORK

The 9-step methodological framework of Coast-Adapt is shown below:



CONCEPTUALISATION

STEP 1:
PROBLEM DIAGNOSIS & PURPOSE DEFINITION

Clearly articulate the problem the adaptive capacity assessment is intended to address. This should be based on a comprehensive understanding of the context and requires examining the specific needs of potential beneficiaries and how the assessment can inform short/long term decisions. Based on the latter, determine the purpose of the assessment, considering the specific decision context. For example: allocate funding for an adaptation project; understand how to enhance adaptive capacity to enable adaptation; or prioritise local implementation of a certain policy.

Pay particular attention to determining the impacts of the defined problem (e.g., climate change can be manifested through multiple risks such as sea-level rise or flooding), and who (e.g., communities or specific groups) it affects.

Bear in mind that coastal communities are socially complex and adaptive systems where people are intrinsically connected to ecosystem functions/services, as well as other social processes, which will influence their ability to adapt to change. Hence, it is critical to involve multiple stakeholders in this process. This includes groups and individuals who may not usually be allowed or able to take part, so as to clearly understand the elements that should be incorporated in the evaluation, values and challenges of the entire community.

STEP 2:
DEFINE ADAPTIVE CAPACITY

Defining what adaptive capacity is in the specific context of the assessment determines what is considered relevant and what elements of adaptive capacity are omitted or incorporated into the assessment. Definitions commonly used are shown below.

Definition	Characteristics	Example
Adaptive capacity as the ability to adjust/change	Based on the IPCC Third assessment report. Assumes that adaptive capacity is the ability of the system to change, adjust, respond and adapt to the adjust of climate change and variability	"the ability of a system to adjust to climate change (including climate variability and extremes), to take advantage of opportunities or to cope with the consequences" (Folland et al., 2001)
Adaptive capacity as coping capacity	Adaptive capacity is seen as the capacity to cope with environmental contingencies, that is, to be able to maintain or even improve its conditions in the face of changes in the environment	"ability of the fishing communities to cope with the dynamics of fisheries resources due to climate variability impacts" (Dzoga et al., 2018)
Adaptive capacity as a resource	Based on capabilities theory and sustainable livelihood, this definition sees adaptive capacity as a function of entitlement to material assets and social opportunities	"Adaptive capacity can be thought of as the resources available to adapt to change as it occurs, and the capability to deploy these resources in order to achieve adaptation goals" (Adger et al., 2012)
Mixed		"Adaptive capacity is a latent characteristic that reflects people's ability to anticipate and respond to changes, and to minimize, cope with, and recover from the consequences of change" (Cinner et al., 2013)
Others		"Adaptive capacity is the system's ability to attract emergy inflows to recover and to adjust from the impacts of hazards" (Chang & Huang, 2015)

It is important to discuss and reflect collectively on the key concepts of adaptive capacity and together determine the specific conceptual understanding of adaptive capacity with affected stakeholders and communities. This will create a common ground and avoids confusion or misunderstandings down the line, when specific measures and policies are deliberated and implemented. Additionally, it ensures that the needs and perspectives of different social groups are considered.

STEP 3:
SELECT A THEORETICAL APPROACH

A theoretical approach is key in guiding the whole assessment. In defining a theoretical approach to adaptive capacity, those conducting an adaptive capacity assessment make important decisions about how they understand the key components of social-ecological systems interacting with each other and how these affect adaptive capacity.

Two main theoretical frameworks are used to understand how adaptive capacity interacts with social-ecological systems in assessments:

- the risk-hazard framework (e.g., IPCC 2007) which considers adaptive capacity in relation to how it will interact with a specific risk or hazard; and
- the sustainable livelihoods approach (Sconnes, 1998) which assesses how climate variability and change affect the vulnerability context of specific livelihoods (e.g., fisheries).

The risk-hazard framework has been widely used in coastal social-ecological systems and is useful to evaluate adaptive capacity in the context of reducing vulnerability to external risks. The sustainable livelihoods approach usually focusses on understanding how adaptive capacity relates to other forces such as policies, institutions and markets, although it might also be used to link adaptive capcity to risk. See Evariste et al. (2018) and Maina et al. (2016) for examples of the application of the risk-hazard framework, and Aswani et al. (2019) and Freduah et al. (2019) for the application of the sustainable livelihoods approach.

CHARACTERISATION

STEP 4 & 5:
DETERMINE LEVEL OF SOCIETY & TEMPORAL SCALE

A key issue is to define the level of society on which the assessment will focus, e.g., community, jurisdictional or national, and the time scale, e.g., the present, to predict future response or to understand how adaptive capacity was enacted in the past. Key questions to ask are adaptive capacity: of what?, of whom?, for whom?, to what stressors?, and to which rate of change?

The definition of these questions should correspond to the underlying processes that affect management decisions to enhance adaptive capacity.

In this way, the scale of assessment would be compatible with the objectives of the assessment and the policy process it is intended to support.

> For example, if the objective is to understand how a certain policy will affect adaptive capacity at the national level, then the assessment of adaptive capacity could focus only on present or past experiences and remain limited to national boundaries.

STEP 6:
SELECT ATTRIBUTES OF ADAPTIVE CAPACITY

Adaptive capacity indicators are characteristics that can be measured or estimated to track the state or trend of adaptive capacity in systems. Defining which indicators will be used in an assessment is key, as they give value to what is considered particularly important about adaptive capacity in the system under study. Below are some examples of indicators that can be used to measure adaptive capacity.

Type of determinant	Type of indicator	Example of indicators
Natural capital	General	Health and diversity of natural resources, changes in resources base, average number of events (floods, droughts)
Socio-demographic dimensions	General	Percentage of population in workforce, size of the community (members, age structure, gender), dependency ratio, fraction household with female members, employment, poverty index
Access to assets	Level of education	People educated, literacy rate, high school status, school attendance
	Access to material assets	Access to sanitation, quality/access to housing, boat/gears assets
	Financial status	Access to credit, savings, insurance, weekly income
Livelihood diversity & flexibility	Livelihood & income diversity	Alternative source of livelihood, experience in fishing, income diversification
	Level of dependence of natural resources	Commercial fishing reliance index, diversification of fishing areas
	Migration patterns	Place attachment, occupational mobility
Learning & knowledge	Diversity of knowledge & information sources	Weather and sea conditions information, disaster awareness
	Perception of risk	Risk behaviour, perceptions on who/what is at risk
Governance & institutions	Social capital & network	Ration of receiving, ratio of money lending, governmental assistance, level of cooperation
	Quality of governance & leadership in environmental policies & agencies	Leadership, levels of corruption, ability to secure sources for adaptation, regulatory quality

Bias towards specific or limited types of indicators may miss critical elements of how adaptive capacity works in the system. As such, a range of indicators should be considered to capture the complexity and dynamism of adaptive capacity in coastal social-ecological systems, including those that:

- are related to the conditions under which reserves of capacity can be mobilised, such as aspects of governance, learning and knowledge, and perceptions of risk/confidence; and
- show cross-scale linkages between different social levels to reflect how adaptive capacity moves between individuals, networks and other levels of decision-making (e.g., peer-to-peer lending, community grants or loans), and the policy conditions that facilitate these transfers.

The co-creation of indicators with community members and/or key stakeholders involved in the assessment process is essential to ensure that the indicators selected are context-based and reflect how local people understand and adapt to change.

POLICY APPLICATION

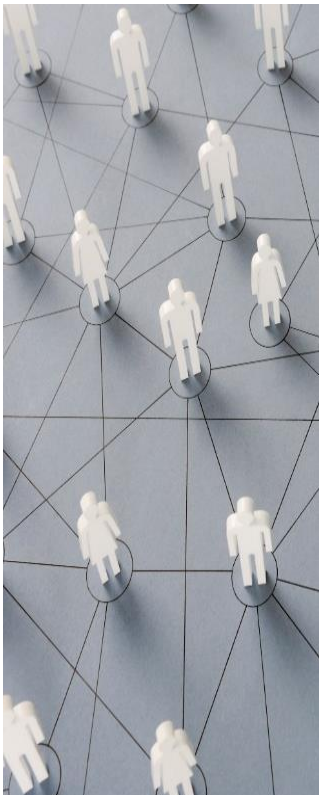
STEP 7:
CONSIDER WHERE THE ASSESSMENT WILL CONTRIBUTE IN THE POLICY PROCESS

A key issue in linking evaluations to action is that the methodological choices of evaluations are in line with practical needs. Without a clear idea of how the evaluation will contribute to policy or action, it may be less likely to be used in practice.

> For example, an assessment might suggest limitations in education, agency or access to financial support and fishing gear limit the adaptive capacity of fishers in a specific community. This would be useful for understanding individual-level drivers, but might be less useful for developing policy to support fishing communities because this often involves higher-level decision-making and coordination between institutions or networks of fishers; considerations which were not taken into account in the assessment.

One way to overcome this is to consider which stage in the policy process the assessment results are intended to contribute. This may be agenda setting, policy formulation, implementation or evaluation. This should be aligned with the conceptualisation stage of an adaptive capacity assessment and be continuously considered during the implementation of the assessment.

STEP 8:
INCORPORATE LOCAL PARTICIPATION EARLY ON & THROUGHOUT THE ASSESSMENT



Inclusive knowledge co-production processes can contribute greatly to make adaptation more effective and socially equitable. Promoting broader participation and fostering a collaborative and learning-oriented process integrates different ways of thinking about adaptive capacity. This reduces biases towards certain kinds of knowledge and enhances imaginative solutions.

However, local knowledge is often only incorporated in adaptive capacity assessments during data collection. This can:

- restrict the context-specific validity of assessment findings; and
- mean that the assessment is driven by the perspectives and opinions of those conducting it on what the problem is and possible solutions.

To overcome this, inclusive stakeholder engagement should be deliberately planned for as early as possible in the assessment process. The assessment should transparently and meaningfully integrate different stakeholder perspectives and views throughout.

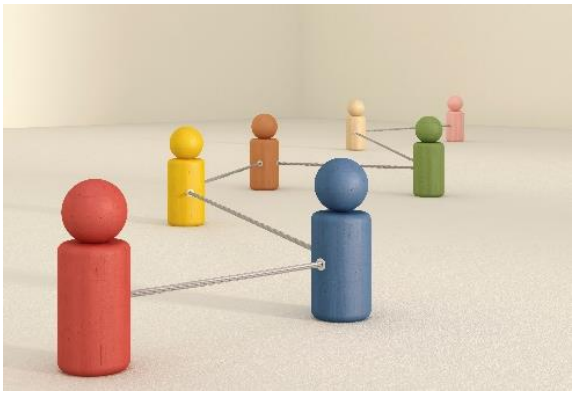
This should be accompanied by a reflexive approach where those conducting an assessment consider how their own values and assumptions influence evaluations, and shift from seeing themselves as experts to participants in knowledge production.

STEP 9:
PURPOSELY SUPPORT KNOWLEDGE SHARING-LEARNING

Social learning is recognised as a critical aspect of improving adaptive capacity as it enables collective action through dialogue and learning from multiple and divergent local perceptions and values.

Participatory approaches that support social learning and knowledge sharing should therefore be purposefully planned for during an adaptive capacity assessment.

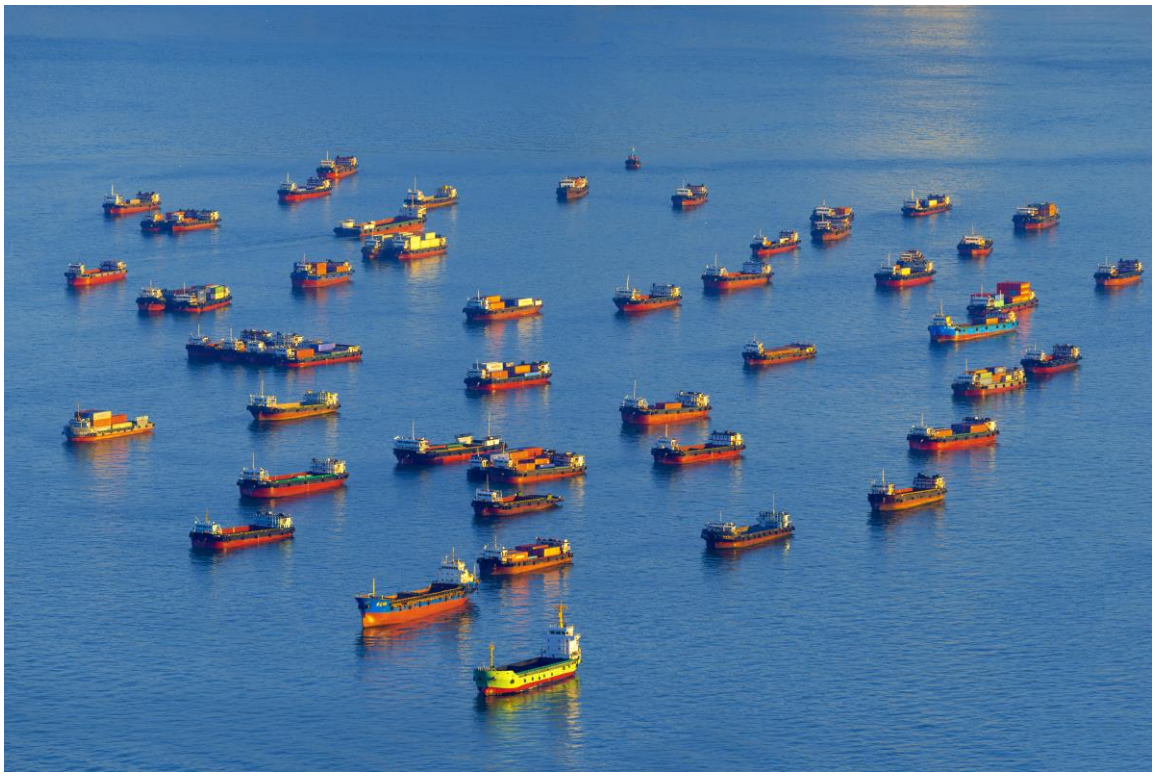
For example, during data collection complementary to surveys, focus group discussions could be supported, where multiple stakeholders can discuss and share their views.



CONCLUSIONS

Different adaptation strategies (e.g., livelihood enhancement, knowledge management, institutional change) have their own advantages and constraints which vary with local context. The selection of specific strategies should be developed based on a dynamic approach that prioritises specific contexts and scale. Successful adaptation in coastal-marine social-ecological systems must, therefore, be based on the application of a combination of several adaptation strategies, which should be applied progressively depending on how the future unfolds, considering a diversity of knowledge and stakeholder preferences, in a context of uncertainty and flexibility in planning.

Adaptive capacity assessments can contribute to building better adaptation pathways. However, the way in which adaptive capacity is framed will have consequences for the type of methodology chosen, as well as the types of policy solutions. Application of Coast-Adapt will support the design, implementation and application of index-based adaptive capacity assessments that can effectively support adaptation strategies in coastal social-ecological systems by overcoming bias in framing and providing a transparent process.



REFERENCES

Adger WN, Barnett J, Brown K, Marshall N, O'Brien K. (2012) Cultural dimensions of climate change impacts and adaptation. Nature Climate Change 3(2):112-117. doi:10.1038/nclimate1666

Aswani S, Howard JAE, Gasalla MA, Jennings S, Malherbe W, Martins IM, Salim SS, van Putten IE, Swathilekshmi PS, Narayanakumar R, Watmough GR. (2019) An integrated framework for assessing coastal community vulnerability across cultures, oceans and scales. Climate and Development 11(4):365–382. doi:10.1080/17565529.2018.1442795

Chang LF, Huang SL. (2015) Assessing urban flooding vulnerability with an emergy approach. Landscape and Urban Planning 143:11–24. doi:10.1016/j.landurbplan.2015.06.004

Cinner J, McClanahan T, Wamukota A, Darling E, Humphries A, Hicks C, Huchery C, Marshall N, Hempson T, Graham N, Bodin Ö, Daw T, Allison E. (2013) Social-ecological vulnerability of coral reef fisheries to climatic shocks. FAO Fisheries and Aquaculture Circular No. 1082. Rome, FAO. 63 pp.

Dzoga M, Simatele D, Munga C. (2018) Assessment of ecological vulnerability to climate variability on coastal fishing communities: A study of Ungwana Bay and Lower Tana Estuary, Kenya. Ocean and Coastal Management 163:437–444. doi:10.1016/j.ocecoaman.2018.07.015

Evariste FF, Denis Jean S, Victor K, Claudia M. (2018) Assessing climate change vulnerability and local adaptation strategies in adjacent communities of the Kribi-Campo coastal ecosystems, South Cameroon. Urban Climate 24:1037–1051. doi:10.1016/j.uclim.2017.12.007

Folland CK, Karl TR, Christy JR, Clarke RA, Gruza GV, Jouzel J, Mann ME, Oerlemans J, Salinger MJ, Wang S-W. (2001) Observed climate variability and change. In: Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Houghton JT, Ding Y, Griggs DJ, Noguer M, van der Linden PJ, Dai X, Maskell K, Johnson CA. (Eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881pp.

Freduah G, Fidelman P, Smith T F. (2019) A framework for assessing adaptive capacity to multiple climatic and non-climatic stressors in small-scale fisheries. Environmental Science and Policy 101:87–93. doi:10.1016/j.envsci.2019.07.016

IPCC. (2007) Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE. (Eds.)]. Cambridge University Press, Cambridge, UK, 976pp.

Maina J, Kithiia J, Cinner J, Neale E, Noble S, Charles D, Watson JEM. (2016) Integrating social-ecological vulnerability assessments with climate forecasts to improve local climate adaptation planning for coral reef fisheries in Papua New Guinea. Regional Environmental Change 16(3):881–891. doi:10.1007/s10113-015-0807-0

Sconnes I. (1998) Sustainable Rural Livelihood, A Frame for Analysis. IDS Working Paper 72. University of Sussex, Brighton.

Lund University Centre for Sustainability Studies (LUCSUS) is a world class sustainability centre for research, teaching and impact where we work to understand, explain, and catalyse social change and transformations in relation to material limits in the biosphere. At LUCSUS, we create theoretically innovative and empirically rigorous knowledge to understand and explain pressing sustainability challenges.

Marine Coastal Ecosystems Biodiversity and Services in a Changing World (MaCoBioS) was a four year research project running between 2020 and 2024 funded by the European Union's Horizon 2020 research and innovation programme. Its objective was to inform efficient and integrated management and conservation strategies for European marine and coastal ecosystems to face climate change by: (a) advancing the scientific evidence base on ecosystem functioning, and (b) developing tools to assess vulnerability and advancing understanding of potential management options.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869710