PROGRAMME

Methodological Framework for Prioritisation in Coastal Planning

Report

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2.1 Mediterranean Coastal Zones Climate Resilience Water Security and Habitat Protection

Methodological Framework for Prioritisation in Coastal Planning

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1. Context & introduction

Coastal regions around the world, and in particular in the Mediterranean basin, are changing rapidly. Coastal zones typically concentrate human activity and are also key biodiversity hotspots thanks to their location at the interface of land and sea. Yet coastal zones are also experiencing the impacts of global change first hand. Coasts are places where the multiple and interconnected risks of the anthropogenic 'polycrisis' (Gambhir *et al.*, 2025) can hit hard.
Coastal seascapes are productive and diverse land-sea systems that provide many benefits to people yet are also increasingly threatened by human activities (Pittman *et al.*, 2022).
In this prioritisation framework, we conceptualize coastal regions as social-ecological systems (SES) – systems in which all humanly used resources are embedded (Ostrom, 2009; Hossain *et al.*, 2020). While the potential for sustainable synergies between human and natural components of such coastal social-ecological systems is definitely present, the SES term itself already hints at the multiple economic, social and environmental 'uses' of these systems and hence carries with it the need to acknowledge, understand, transparently motivate and manage trade-offs.

Any attempt at managing coastal zones towards sustainability and resilience means that priorities have to be defined, understood, motivated and acted upon. Dealing with the interconnected challenges which are shaping coastal zones nowadays requires a systematic, step-wise, socially robust and evidence-informed approach.

The objective of this framework is to assist a wide range of stakeholders (public authorities, planners and practitioners in coastal planning and management of coastal zones) in the Mediterranean Basin to comply with the Protocol on Integrated Coastal Zone Management (ICZM), strengthening and expanding ICZM in the Mediterranean region and adopting national ICZM Strategies, coastal plans, and instruments. This framework supports the elaboration of the Guidelines for Coastal Planning within the framework of the GEF (Global Environment Facility) 'Med Programme'. This framework is linked to the '5-step guide to prepare and deliver coast plans'.

Public authorities and practitioners in coastal management and planning often need to prioritise solutions to challenges their areas are facing, such as climate change adaptation options, nature-based solutions, or any planning measures for the territory that falls under their responsibility. Sometimes prioritisation is avoided and items are listed in alphabetic order. Other times they leave the choice to someone else, for the future. Sometimes, they put forward the issues that have received the loudest advocacy.

This framework aims to contribute to respond to the following questions: How can we perform a systematic prioritisation in coastal planning and in ICZM? How to prioritise in line with the overall goal of sustainable and resilient coastal development?

2. Objectives of this prioritisation framework

Overall objective:

- To propose a methodological framework on prioritisation of measures/options/solutions in integrated planning for coastal zone sustainability;

Specific objectives:

- To provide guidance for the establishment of priorities of measures/options/solutions in coastal planning that contribute to the ecological pillar of sustainable development;
- To raise awareness of the coastal risks and adaptation related to the coastal zones;
- To inform stakeholders in coastal regions that establishing priorities is a complex process that can be systematic, transparent, and clear;
- To guide coastal regions towards enhancing sustainability and resilience;
- To demonstrate that the proposed methodological framework can be tested in a real-life context.

The target audience consists of regional and local public authorities, planners and practitioners in coastal planning and management of the coastal zones in the Mediterranean countries.

3. Methodology & structure

This document is structured as follows: Section 4 highlights the importance of prioritisation in coastal areas when facing multiple challenges. Section 5 lays the foundation of the prioritisation framework it proposes key prioritisation *principles*. Section 6 elaborates on these principles and proposes prioritisation *criteria* while Section 7 proposes a specific prioritisation *method*.

Figure 1: The prioritisation hierarchy used in this framework

Principles are defined as value-based guidelines that shape *how* prioritisation should occur. Criteria translate prioritisation principles into actionable decision-factors. Criteria are specific, measurable factors used to *evaluate* and *compare* options. *Methods* are used to *apply* the criteria. In short, principles define the *why and what matters most*; criteria define the *what to measure and compare;* and methods define the *how to decide and implement.*

While this prioritisation hierarchy will structure the framework, the content of the framework is based on a review of scientific literature on prioritisation in coastal planning, conservation and sustainability. Other strands of literature which have been sourced include the impact assessment literature.

4. Why prioritise?

4.1 What is prioritisation for?

As coastal zones are facing multiple interconnected challenges, isn't everything just as urgent? Does prioritisation mean some challenges are less important than others? What about the risk of abuse of lists of priorities (*e.g.* some issues may be sidelined forever, some voices may be silenced again and again..? What about the inherent dynamics of coastal challenges and hence of prioritisation strategies? Indeed some prioritisation principles, criteria and/or methods may change, reflecting changing societal preferences and/or changing context and environmental conditions (Sutherland, 2024). These questions do not make prioritisation less challenging, but they indicate that before starting to prioritise, we need to stop and think about what will guide our prioritisation exercise. Why do we need it? How will the prioritisation exercise be steered?

To put it simply, we need prioritisation as coasts are inevitably shared among multiple users. These users consist of multiple stakeholder groups with partly overlapping, partly competing claims, but also includes non-human users with whom we share coastal zones and which we need to take int account. Henc any decision related to activities to be established in coastal areas is complex and requires careful consideration (Da Luz Fernandez *et al.*, 2018; Liu *et al.*, 2025; Pittman *et al.*, 2025).

Wee need prioritisation in coastal planning because of:

- Resource limitations (financial, institutional, human, space limitations): not everything can be done at once or on the same spot, and the scarcity of resources forces us to think about how to maximize positive sustainability impacts while minimizing negative sustainability impacts.
- Time limitations: activities need to be sequenced, as some activities are more urgent than others, especially as climate change upends earlier plans and requires constant readjustment.
- Multiple and competing uses of coastal zones, underpinned by a plurality of stakeholder value preferences. Basically, 'we want many things at once' – multifunctional coastal zones are expected to provide a range of benefits to people, which means that different management options arise, highlighting the need to choose and hence prioritise (*e.g.* prioritizing some ecosystem services over others).
- Transparency requirements: prioritisation strengthens the quality of decision-making and potentially increases legitimacy. It makes it easier for all involved stakeholders to contribute to decision-making by weighing in and by understanding how decisions are made.

In a nutshell, prioritisation serves as both a practical and strategic response to the multifaceted challenges facing coastal areas.

Prioritizing is deciding, more specifically, prioritisation focuses shaping pathways towards reaching set objectives. As long as the objectives are clear, prioritizing could, at least in theory, be based on how these set objectives can 'best' be reached.

Coastal planning for long-term sustainability means that decision-makers (and that's ultimately what all coastal stakeholders are, to varying degrees) operate in today's volatile, uncertain, complex and ambiguous ('VUCA') world and not in a simple, stable, structured and certain (SSSC) world (Vermeulen & Hémond, 2025).

Hence prioritisation happens in a context of complexity, uncertainty and plurality of values. These are the context-defining features of prioritisation for coastal sustainability which we explore in Section 4.2.

4.2 The context: complexity, uncertainty and pluralism

4.2.1 Complexity

Complexity refers to the fact that coastal sustainability issues are intrinsically interwoven and that these interactions within coastal social-ecological systems are context-defining (Wright & Nichols, 2019). Complex issues concern a web of related problems, lie across or at the intersection of many sectors and disciplines and the underlying processes interact on various temporal and scale levels (van Asselt & Rijkens-Klomp, 2002). Complexity typically applies to systems showing deep uncertainties and a plurality of legitimate perspectives.
Coastal complexity is present at various levels: First, the intrinsic complexity of an urgent societal challenge such as coastal planning creates an ever-growing need for information, debate and…prioritisation. Any simplification which inevitably comes with prioritisation, needs to be duly and transparently documented and motivated. Secondly, the institutional complexity arising from the realities of multilevel, polycentric governance networks blurs the boundaries between responsibilities of classical jurisdictional entities such as nation-states and players such as sub-national entities, formally and informally organized stakeholder groups and multilateral organisations. Hence an open-minded, complexity-acknowledging and plural approach to prioritisation is needed.

4.2.2 Uncertainty

Uncertainty is a key feature of sustainability-oriented coastal planning, as planning and associated prioritisation are by definition a future-oriented processes in which one has to project him/herself into the future. Complex social-ecological system interactions and their outomes are difficult to predict, and scholars make a distinction between weak uncertainty (which refers to probability distributions based on the reliable classification of possible events) and strong uncertainty (which refers to events whose probability distributions are unknown). In order to deal with uncertainty, a learning mindset and a highly adaptive prioritisation approach (e.g. allowing for finetuning, adding or removing prioritisation criteria and adjusting their respective weights) are required.

4.3.2 Pluralism

A third defining feature is pluralism: the simultaneous existence of multiple legitimate normative viewpoints and values carried by different stakeholder groups (Chan *et al.*, 2016). Following IPBES (2022), pluralism can refer to worldview pluralism, to value pluralism, to epistemic pluralism and to methodological pluralism. For prioritisation of coastal planning actions, all are relevant, yet we will follow a pragmatic interpretation of pluralism in this current framework. Prioritisation carries with it the promise of operationalizing rationality, by the selection and ranking of alternative actions that best serve preselected goals, given the values, constraints and available information. This operationalization of rationality is what we aim to elaborate upon in this framework, yet one does need to acknowledge that 'rationality' itself is multi-interpretable, which will be further explore in Section 5. Rationality is based on values, and various decision-makers and other stakeholders do not necessarily share the same values. Indeed values define the importance assigned to principles, goods, services, and constraints and values greatly influence the practical context (legal, financial or biophysical restrictions) that influences the feasibility of decisions (Araujo, 2025). Rationality determines how values and constraints are weighed in prioritisation.

5. How to prioritise? Prioritisation principles

5.1 Navigating multiple rationalities

Having established that prioritisation is necessary, we now need principles: value-based guidelines that shape *how* prioritisation should occur, that guide us in our quest to prioritise as well as we possibly can.

Prioritisation needs to help decision-makers to navigate complex data by integrating values and constraints to optimize pre-set outcomes, which in our case are supposed to embody (environmentally) sustainable coastal planning. However these decisions are underpinned by multiple types of rationality (technical, economic, social and political rationalities), each weighting values and constraints differently (Araujo, 2025) — which is a challenge for prioritisation.

Technical rationality focuses on selecting the best means to achieve a predetermined goal, and emphasizes optimization and effectiveness. In environmental sustainability, it involves *e.g.* meeting biodiversity targets through scientific data and computational models. *Economic rationality* focuses on resource efficiency, and balances costs and benefits to achieve the targets at minimal cost. *Social rationality* prioritises community needs, social equity and public support, and acknowledges that different groups have conflicting interests, which makes a singular 'optimal' solution difficult to reach. *Political rationality* pivots around power dynamics, and often requires compromises that secure the support of key actors involved, including multiple stakeholders. Hence prioritisation happens in complex landscapes where these multiple rationalities interact (whether one likes it or not).

Standard protocols for prioritisation (Figure 1, left) often inadequately account for the social complexity of decisions and -with the best intentions- shift prioritisation authority from political decision-makers to scientists. Hence such approaches (even when methodologically sound) can be misaligned with the concerns and values of the multiple stakeholders involved in and affected by the prioritisation exercise (Araujo, 2025). Integrating multiple rationalities into prioritisation (Figure 1, right), beyond mere technical rationality, is essential in prioritisation.

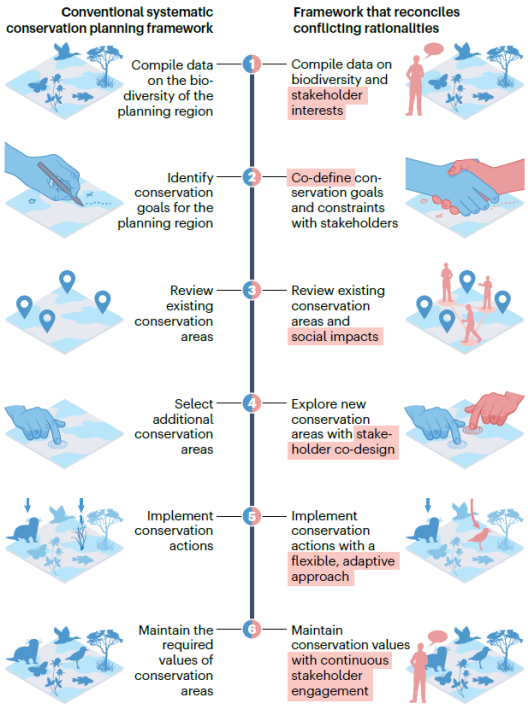

Figure 1: Towards a prioritisation framework that reconciles different rationalities (adapted from Araujo, 2025)

Hence we need prioritisation principles which allow for different rationalities, different perspectives to be taken into account. Because in complex social-ecological settings, disagreements among stakeholders and shifting environmental baselines can jeopardize even the best technical designs. We therefore propose a shortlist of prioritisation principles in Section 5.2.

5.2 A shortlist of prioritisation principles

We propose the following prioritisation principles (inspired by Benson & Craig, 2014; Marignani *et al.*, 2017; Keeler *et al.*, 2019; Jozaei *et al.*, 2020; Pittman *et al.*, 2022; Araujo, 2025):

- *Adaptability and agility*: (including an openness for iterative learning and readjustment of prioritisation approaches, including during a prioritisation process). Adaptive management is needed to avoid prioritisation exercises guided by the fear to avoid failure, leading to "fail-safe" systems instead of "safe to fail" ones. The underlying premise of risk-based approaches is that social-ecological systems are predictable: that social and environmental changes, and their associated risks, can be anticipated. Such assumptions are doomed to fail and result in excessively risk-averse mindsets among decision-makers. We therefor call for an 'agile' prioritisation framework.
- *Social-ecological systems approach*: combining and integrating ecological and social prioritisation criteria in order to reflect a holistic take on sustainability. See e.g. Keeler et al., 2019: "*We argue that prioritisation metrics need to consider not only biophysical data on the supply of ecosystem services but also socioeconomic data that highlight the value of those services*". This approach is linked to 'ecosystem-based management', recognizing that ecosystems provide a range of benefits to people, thereby highlighting connections between social and ecological components of complex systems.
- *Pluralism*, both in terms of diversity of expertise of those involved with the prioritisation, and in terms of the diversity of rationalities that underpin prioritisation (see also Section 5.1).

- *Participation & collaboration,* in order for plural rationalities to be included in prioritisation, and in order to strengthen the societal legitimacy of decision-making.
- *Equity*: consider social vulnerability, fair distribution of the positive and negative effects of prioritisation choices.
- *Pragmatism*, including proactively addressing the coexistence of multiple rationalities among those conducting prioritisation. Without accounting for these factors, prioritisation remains detached from policy implementation.
- *Transparency* in the decision-making process, including the rationale underlying decisions.

6. How to prioritise? Prioritisation criteria

In coastal planning, prioritisation criteria refer to the set of factors and weights applied to determine *which* actions, areas or decisions should be addressed first, given the constraints of time, resources and competing goals (see Section 4). Prioritisation criteria help decision-makers allocate effort and investment in a systematic and transparent way—recognising that not all coastal actions (or places) carry the same urgency, risk or benefit.

In Table 1, we propose non-comprehensive list of prioritisation criteria (inspired by a.o. Game *et al.*, 2013; Scherer *et al.*, 2014; Pittman *et al.*, 2022; Sutherland *et al.*, 2024; etc.). This list provides a potential structure and categorization and a source of inspiration from which to select context-specific, customised criteria (see Section 7 for a stepwise method). We strongly recommend to select context-appropriate criteria in any prioritisation process, ideally in a participatory way. It is interesting and surprising to read that, in a review of multi-criteria analysis exercises conducted in ecology and conservation, Adem Esmail & Geneletti (2018) found that only 22% of the reviewed studies included stakeholders in the selection of prioritisation criteria.
We now present a short explanatory note on each category of criteria presented in Table 1.

6.1 Criteria focusing on existential threats

This category encompasses threats that directly undermine the conditions to human survival and community continuity. Acute threats include storm surges, tsunamis, extreme flooding (from marine and pluvial origins), rapid seashore collapse etc. The potential irreversibility of decisions also needs to be taken into account. Existential threats can be reduced by building resilience and reserves to increase survivability in a range of extreme scenarios) but it is more important to build capacity to improve humanity's ability to deal with larger existential risks, e.g. related to anthropogenic climate change (Bostrom, 2013). Indirect existential threats to human life are integrated into other criteria (*e.g.* exposure to hazards such as extreme weather events, which may occur more frequently and with more severity due to anthropogenic climate change);

6.2 Criteria focusing on hazard, vulnerability and risk

Such criteria relate to the physical threats or stresses facing the coast and how vulnerable entities such as areas, communities or species are impacted. These criteria include the likelihood of flooding or erosion, sea-level rise vulnerability, storm surge risk, sediment supply or erosion, subsidence risk, rate of shoreline retreat rate, inundation frequency. Various physical parameters like wave height, sea-level change, sediment transport must be paired with socio-economic ones (such as vulnerability to climate change events) to assess risk.

6.3 Criteria focusing on ecological and environmental value

These criteria assess the ecological importance or environmental status of coastal zones; e.g., habitats, biodiversity, stocks and flows of ecosystem services (nature's contributions to people), 'naturalness' (e.g. degree of anthropogenic modification of the landscape). Conservation features such as the presence of sensitive habitats or species, biodiversity value, ecological connectivity,):

6.4 Criteria focusing on socio-economic values

These criteria concern the human dimension: the value of assets (such as built infrastructure), people, infrastructure, or economic activities that may be at risk or provide benefit, economic value of land uses (tourism, fishing), people's willingness to pay for certain activities. Other examples include residents density, employment in coastal zones, fishery / aquaculture value.

6.5 Criteria focusing on economic cost and feasibility

These criteria complement other criteria by bringing in a pragmatic, realistic lens. Sometimes, decisions get prioritised because of certain content- or process-based criteria yet due to cost, lack of institutional capacity and/or stakeholder resistance, their implementation is hypothetical and hence one may need to requalify their degree of priority..

6.6 Criteria focusing on temporal components, urgency and change dynamics

These criteria take into account how immediate the need is , how fast change is occurring, or expected future dynamics, including the degree of (ir)reversibility of change and adaptability. These criteria also include factors such as novelty, likelihood of occurrence of specific events.

6.7 Criteria focusing on spatial components, land use and allocation

These criteria relate to the spatial context: how accessible or connected the site is, how it fits with land-use, conflict of uses, adjacency to vulnerable and/or high biodiversity zones, infrastructure or communities. These criteria include: ecological and (socio-)economic connectivity, conflicts among uses, existing infrastructure, accessibility for diverse stakeholder groups.

6.8 Criteria focusing on governance

Governance/participation criteria include stakeholder preferences, context-dependent, local decision-maker priorities. Institutional criteria include cost, available resources, governance capacity or capability (which can be inferred from the status of implementation of past actions), institutional coordination, compatibility with other plans and policy objectives, regulatory readiness, legal or public administrative determination to carry out the project, projected budget & human resources**.**

6.9 Overview of prioritisation criteria to be used in coastal planning

In actual prioritisation exercises, multiple criteria are combined. We do not prescribe the use of specific criteria instead of others, as the choice of criteria is context-specific. Criteria selection is an integral part of the prioritisation methods (see Section 7). However we believe that a longlist of possible prioritisation criteria may be a source of inspiration for real-life coastal prioritisation exercises.

Criterion category	Prioritisation Criteria
Existential threat	Existential threat to human life: this criterion highlights threats that directly undermine the conditions to human survival and community continuity. Acute threats include storm surges, tsunamis, extreme flooding (from marine and pluvial origins), rapid seashore collapse etc.
Hazard, vulnerability & risk criteria	**Exposure to hazards**: Degree to which the activity, site or asset is exposed to/vulnerable to coastal hazards such as storm surge, erosion, sea-level rise, flooding, inundation, storm surge, extreme weather events
	Effectiveness of the action in reducing risk: How well the proposed action or site would reduce risk (take infrastructural and nature-based solutions (NbS) into account).
	Adaptability: Ability of the option to adjust or adapt to changing conditions (climate change, future land-use, changing stakeholder preferences).
	Residual risk: Magnitude and (ir)reversibility of potential impact if a hazard occurs and the intervention fails or is insufficient.
Ecological & environmental value criteria	**Impact on conservation significance** in terms of habitat or species richness, presence, unicity or significance (e.g. IUCN species categories, legal protection),
	Impact on ecosystem services provision
	Environmental impact (degree of negative impact to be expected, e.g. in terms of pollution or habitat loss)
	Impact on resilience to future environmental pressures (e.g. impact on capacity to deal with future (climate) change; impact on 'stoppable threats')
	Impact on ecological connectivity and spatial integrity (e.g. impact on ecological corridors or migration routes)
Socio-economic value criteria	**Community benefit:** Which stakeholders and how many benefit from the action (e.g. in terms of protection, access to resources or livelihood provision).
	Impact on public amenities, access and quality of life: Contribution to community amenities, access to the coast, recreational value, quality of life improvements.
	Impact on cultural heritage and sense of place: Impacts on cultural or heritage sites, indigenous values, landscape character, community attachment to natural features of the coast.
	Impact on equity: impacts on vulnerable stakeholder groups in terms of access, benefits and capabilities.
	Impact on stakeholder acceptability / societal support base: degree of support among various stakeholders, expected conflicts, community readiness, community support or resistance.

Economic cost & Feasibility criteria	**Capital and construction cost**: Initial investment required for the action.
	Ongoing operational & maintenance cost: Future costs to maintain the intervention, lifetime cost, cost-effectiveness.
	Economic benefit / return on investment: Benefits in terms of avoided losses, increased revenue, job creation, distribution of benefits among various stakeholder groups.
	Technical and institutional feasibility: Availability of technology, local capacity, regulatory/permit feasibility, time resources to implement the action.
	Cost-effectiveness: Relative value for money, comparing cost to benefit achieved.
Temporal criteria, including urgency and change dynamics	**Longevity of the action:** Lifespan of the proposed action, how long it will remain effective.
	Urgency and time window: e.g. time critical ecological restoration windows (before development encroaches and irreversible impacts occur).
	Sustainable resource use: Use of renewable resources, low emissions/impact, minimal environmental footprint.
	Adaptation to future change: Capacity to accommodate future environmental change (climate change impacts, changing stakeholder needs).
	Avoidance of lock-ins: Whether the intervention avoids locking in sub-optimal solutions that may be costly in the future.
Spatial criteria	**Site suitability**: Whether the physical conditions (terrain, coastal morphology, sediment supply, erosion risk) are appropriate for the action.
	Accessibility for people: ease of access for construction, maintenance, public use; connectivity with other infrastructure or ecological systems.
	Potential for cumulative / synergistic effects: How the intervention fits with other projects, whether it complements or conflicts with adjacent uses or habitats.
	Values of the land: value of the land used for the action in terms of current and future 'blue carbon', tourism and biodiversity value.
Governance criteria	**Compatibility with relevant regulatory environment** (e.g. land use and coastal planning and zoning): Whether the action complies with legal frameworks, policies, marine/coastal planning regulation.
	Institutional capacity: (Local) government or administrative capacity to implement, maintain, and monitor the action.
	Stakeholder engagement & participation
	Policy alignment: Alignment with broader planning strategies, adaptation plans, spatial planning goals, national/regional policy.

	Monitoring & enforcement feasibility: Ability to monitor outcomes, enforce regulations or maintain the action over time.

Table 1: Non-comprehensive longlist of prioritisation criteria (to be) used in coastal planning

6.10 How to use the proposed prioritisation criteria?

Box 1 gives a general overview of the steps to conduct based on the longlist of prioritisation criteria presented in Table 1.

However, (a) specific, stepwise method(s) are/is required to turn this generic synthesis into an actionable 'way to go'. Section 7 proposes a method to actually conduct the prioritisation, based on the Table 1 criteria.

Box 1: Flowchart to use the propose coastal prioritisation criteria

- **Define objectives and options**: For example, the aim might be to reduce coastal hazard risk, or to prioritise restoration of shoreline ecosystems, or to determine which stretches of coastline to protect.
- **Select**: Choose which of the eight criteria categories apply in your context.
- **Adapt**: Tailor criteria (definitions, interpretation) to the appropriate context (*e.g.* coastline type, hazard type, governance setting *etc.*).
- **Score & Weight criteria**: Use a method (*e.g.* pairwise comparisons, stakeholder survey, analytic hierarchy process) to assign weights and scores for each criterion/option.
- **Assess options (areas, decisions) against criteria**: each options is scored against each criterion.
- **Rank / Prioritise**: Apply the scores to your candidate decisions, areas, strategies, or actions and derive a priority list.
- **Review / Sensitivity**: Conduct sensitivity tests (how robust is your ranking if weights change?) and build in temporal updates (since coastal conditions evolve, think of complexity).
- **Implement and monitor**: Prioritisation is not static; monitoring results may lead to re-prioritisation over time as conditions change.
- **Ensure transparency**: Make criteria, weights, assumptions, data sources explicit. – this transparency helps legitimacy and replicability.

7 How to prioritise?

7.1 Prioritisation methods in a nutshell

Prioritisation methods allow to rank and select alternative options or courses of action to achieve a specific objective, guided by prioritisation principles (Section 5) and criteria (Section 6). Prioritisation is typically the outcome of some kind of multi-criteria analysis, an umbrella term referring to any knowledge synthesis method supporting decision-making by systematically exploring the pros and cons of different alternatives (Adem Esmail & Geneletti, 2018).

Prioritisation criteria can be incommensurable and are typically expressed through different units of measurement (economic value, biophysical value, qualitative preferences etc.). Any

prioritisation exercise should however, allow to combine the analytical comparison of alternative options with stakeholder preferences. This is a condition for successful prioritisation, as it reflects the integration of different rationalities, as outlined in Section 5.

Prioritisation methods typically follow this stepwise approach:

Step 1: Establishing a shared understanding of the decision context and structuring the problem at hand. It entails the definition of the objectives of the prioritisation and the identification of possible alternatives to achieve these objectives.

Step 2: Formulating / selecting prioritisation criteria to assess every alternative option; and weighing the criteria. A weight is a value assigned to a criterion that indicates its relative importance with respect to the other criteria under consideration. Several different techniques can be applied to obtain ordinal or cardinal weights, based on the judgements and perception about the relevance of the different issues at stake (Adem Esmail & Geneletti, 2018). The Analytic Hierarchy Process, AHP) is a method commonly used to weigh prioritisation criteria and derive ranked, prioritised options (Liu *et al.*, 2025; Wadsworth *et al.*, 2014).

Step 3: Assessing every alternative option using a multi-criteria analysis, consisting of assessing every alternative based on the criteria defined in Step 2, and converting this information into a dimensionless scale of preference (a dimensionless expression of the level of desirability and hence priority of the alternatives).

Step 4: Compiling a ranking (or prioritisation) of the alternative options, based on the abovementioned steps. Adapting the output to the set objectives and target audience (in order to communicate actionable, easily understandable findings).

7.2 A stepwise prioritisation method for coastal planning

We hereby propose a stepwise approach to prioritisation in coastal planning, integrating the nominal group technique within a multi criteria analysis approach. This prioritisation method integrates multiple rationalities (Section 5) by including the perspectives of experts and stakeholders in a participatory, inclusive prioritisation exercise.

The approach we propose is a modified version of a classic multi-criteria analysis as outlined in Section 7.1, enriched with a structured participatory exercise (the nominal group technique (NGT) (Hugé & Mukherjee, 2018)) aimed at providing a stepwise, systematic and stakeholder-informed method for the ranking of priorities.

Figure 2 (below) provides an overview of the prioritisation approach in which we use nested NGTs.

Step 1: Situating the decision-context

The first stage of the process aims to establish a shared understanding of the decision context and to structure the problem. It revolves around questions such as: what kind of actions, measures have to be prioritised? Are these decisions about land use? Are these decisions about financial flows, about impact mitigation strategies? Operationally, it includes the definition of the objectives of the decision process and the identification of possible alternatives to achieve these. The prioritisation typically starts with a longlist of alternatives which are considered as potentially living up to the set objectives.

Who is to be involved in Step 1? The decision-makers, who will have to make the eventual decision, the eventual selection of one of the alternatives.

Step 2: Formulating the prioritisation criteria

In this step, explicit prioritisation criteria will be formulated to assess each alternative. In order to determine the best, context-specific, customised criteria for a specific decision process on prioritisation, we propose a systematic, stakeholder-informed criteria formulation process, using the 'Nominal Group Technique' approach (Hugé & Mukherjee, 2018).

In step 2, only the decision-makers (experts) will be involved in this NGT. The expectation is that they will be guided by their predominantly technical and economic rationality (hence introducing one of the rationalities called for in Section 5).

The nominal group technique (NGT) is a structured group-based technique used to build consensus – in our case, consensus among decision-makers (experts) on which prioritisation criteria to use. Every decision-maker (expert) is asked to individually reflect and to propose prioritisation criteria (they can draw inspiration from Table 1 in Section 6). Subsequently, decision-makers (experts) are asked to collectively select (prioritise!) the prioritisation criteria which should be used in the subsequent steps. NGT is based on a combination of individual and collective reflection. As a consensus method, it aims to determine the extent of agreement on the criteria to be used in prioritisation among the group of decision-makers (experts) while at the same time overcoming problems associated with group decision-making processes such as the insufficient participation of inhibited individuals. Advantages of NGT are linked to the fact that it allows the co-production of knowledge which increases all decision-makers' (experts') ownership of the entire prioritisation process.
The NGT procedure can be repeated to determine the weight of every selected criterion, following the same steps.

The outcome of Step 2 is a list of context-specific prioritisation criteria and their respective weight.

Step 3: Assessing alternative options using the prioritisation criteria

At the start of Step 3, the prioritisation criteria and their respective weights are given, as are the alternative options (which were listed in Step 1). Every option is now assessed using the prioritisation criteria.

For Step 3, we propose to use the nominal group technique (NGT) again. Yet this time, the NGT aims to prioritise the actual alternatives (not the criteria, as was the case in Step 2), and the NGT will now be conducted with a different set of participants. This time, the NGT is ideally not restricted to decision-makers (experts), but the NGT participants consist of a range of stakeholders which may be/will be affected by the coastal planning decisions at hand. These stakeholders will introduce different rationalities to the prioritisation process, in line with the principles of Section 5. Stakeholders may introduce social and political rationality in the prioritisation process, thereby making the process more robust and participatory.

The outcome of Step 3 is a prioritised ranking of alternative actions.

Step 4: Synthesis and communication of the prioritisation outcomes

In Step 4, the outcome of the prioritisation exercise will be synthesized and presented in a concise way. The steps of the prioritisation exercise will be documented, the list of criteria used and the ranked alternatives will be presented. The outcome of any prioritisation exercise is an input to a decision-making strategy which will be the responsibility of the ultimate decision-makers.

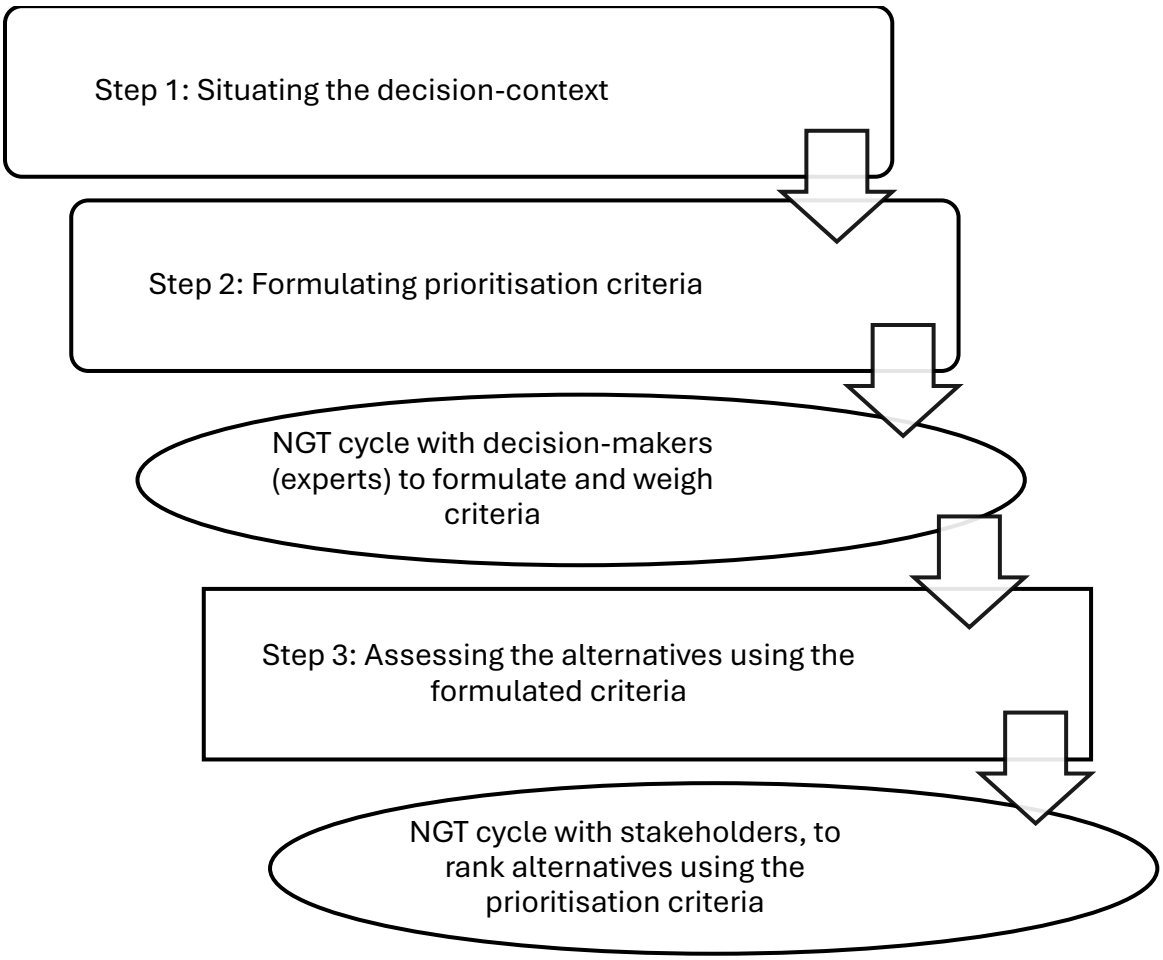

Figure 2: A stepwise approach to implement the coastal prioritisation framework

Box 2: The stepwise approach of the Nominal Group Technique (NGT)

NGT Step 1: Generating ideas
The facilitator provides the participants with one (or two) open-ended question(s): e.g. on criteria categories or on possible criteria to be used. The facilitator subsequently directs participants to individually and silently write down their ideas in brief statements or bullet points. At this stage, there is no direct interaction among participants. Participants are typically given 5–15 min to complete this step. The process of individually reflecting on the topic helps to avoid "production blocking": a common psychological bias in brainstorming in groups. Production blocking refers

to the loss of efficiency in generating ideas in a group setting during verbal brainstorming (only one individual can speak while the others in the group are listening and thereby their thoughts are effectively "blocked").

NGT Step 2: Sharing & recording ideas

The ideas are shared in the group by way of a round robin feedback session (one response per person each time) to record each idea concisely. Each participant can contribute one idea at a time until all ideas are exhausted, and has the opportunity to voice his/her opinion freely, without rejection or modification of their view before the group discussion starts. The ideas for criteria are recorded *verbatim* in real time by the facilitator, on a whiteboard, flipchart or on a computer screen, allowing everyone to see the listed ideas.

NGT Step 3: Group discussion

Once all the ideas are listed, participants are invited to seek clarifications or further elaboration about any of the criteria proposed by the other participants in Step 2. This stage ensures that participants understand the meaning of each idea, enabling them to make an informed decision in the ranking step (Step 4). The facilitator's role is key at this stage, as all participants should be enabled to contribute to the discussion. The participants are encouraged to ask questions to clarify the proposed criteria. Similar criteria are grouped based on an open discussion, while some items could be excluded and others included. There is no value judgement or rating of ideas at this stage.

NGT Step 4: Voting & ranking

There are two main variants for the voting and ranking stage. The first variant involves participants privately rating each idea, typically by scoring points or by a Likert scale. Participants are asked to select and then rank the criteria from the list generated in Steps 2 and 3. The ranking typically operationalizes "preference". Operationalizing preference entails the elicitation of preferences (what option is preferred by someone), and the articulation of those preferences (clarifying what that preference entails, even in the absence of technical and/or quantitative jargon). This step can be repeated, in which case, the participants may be asked to rank a second time, for example ranking the ideas that came out as the top five ideas in the first voting stage. The second variant entails a public voting and ranking of each of the ideas. Participants then vote openly, non-anonymously, thus allowing to gauge the popularity of the proposed ideas. This public voting generates a lot of interaction and group dynamics but it can foster social pressure to conform to the norm, which is why private voting is preferred by some scholars. The results of the vote are compiled by the facilitator and shared within the group. The facilitator creates a tally sheet, showing the ideas receiving the most points. The most highly rated criteria are then identified.

Source: adapted from : Hugé & Mukherjee (2018)

8. Critical caveats regarding prioritisation

Some critical caveats when applying prioritisation in coastal planning:

- **Data and parameter uncertainty**: Many coastal systems are dynamic and poorly quantified; this uncertainty propagates into prioritisation.
- **Subjectivity in the weighting of criteria**: Expert judgement and stakeholder inputs are used frequently; this means transparency and robustness are important.
- **Conflict among criteria**: Sometimes ecological protection may conflict with human development; prioritisation must negotiate between competing goals.

- **Temporal dynamics**: Coastal hazards may increase over time, so priorities can shift — what is critical today may be less so tomorrow, and vice versa.
- **Stakeholder and governance factors**: Prioritisation must recognise who makes decisions, who holds resources, and who is affected.
- **Spatial dynamics**: Criteria and priority outcomes may differ depending on whether the scale is national, regional, local. Some models emphasise multi-scale assessment.
- **Participant selection:** who participates in the prioritisation and why? How is relevant expertise defined in specific prioritisation exercises? (Sutherland & Burgman, 2015)

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