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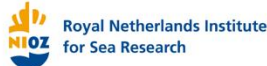
Scenarios Briefing Paper

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This briefing note is one in a series of documents aimed at supporting the Simple Social-Ecological Guidance. For the complete set of briefing documents, please refer to the accompanying signposting document, which can be found here.

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1. What are scenarios?

Scenarios are descriptions of plausible and coherent societal or policy trajectories, which can be used to guide strategy, policy-making and environmental management (IPBES, 2016; Goudeseune et al., 2020). They focus on societal and environmental drivers of change and what the outcomes of those drivers might be. Scenarios are mainly narratives of what the future might look like, although they can include quantitative information and they can also be defined retrospectively. Scenarios are not predictions or forecasts and they are 'possible' not 'likely' futures.

It is unlikely that the 'real' future for a nation will be described by any single scenario, it is more likely that it will be a combination of elements from several scenarios and that individual countries will follow different trajectories at different times.

Scenarios are used in many different contexts, including global applications such as the United Nations Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) activities, as well as local, national and regional initiatives on shared human-environment challenges (e.g. Biosphere Futures – Welcome to our global collection of place-based social-ecological scenario case studies.). Due to their broad usage for a variety of purposes, scenarios can mean different things to different people and there is no one comprehensive and unambiguous definition.

There is also no one overall set of 'true' scenarios. According to IPBES (2016) "*No single combination of scenarios, models and decision-support tools can address all policy and decision contexts…..no single set of scenarios and models can address all pertinent spatial and temporal scales*". There are general scenario frameworks (see sections 2 and 3), but each project can create its own scenarios by tailoring them to project priorities and geographic, societal and environmental conditions. Scenarios do not need to be static and can be updated as knowledge grows or opinions change.

Selecting which aspects of the human-nature relationship are relevant is a value-driven action, taken independently or collectively by society. These value-driven actions (or priorities) are culturally biased, built on shared values and beliefs, and can be explained by the use of worldviews (Ney, 2012; Thompson, 1997). Worldviews describe the bias society has while framing human-nature relations and how they unfold in the future. Plausible future states can, therefore, be enhanced by investigating these worldviews in the local context.

2. Types of scenarios

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) describe three broad families of scenario related to the policy cycle - exploratory scenarios, intervention scenarios and policy evaluation scenarios (IPBES, 2016). Intervention scenarios have two subsets - target-seeking scenarios and policy-screening scenarios. Biodiversa and the Belmont Forum have refined these to simplify the language and provide further guidance for biodiversity decision-making (Goudeseune et al., 2020). The scenario types are visualised in Figure 1 and described in Table 1.
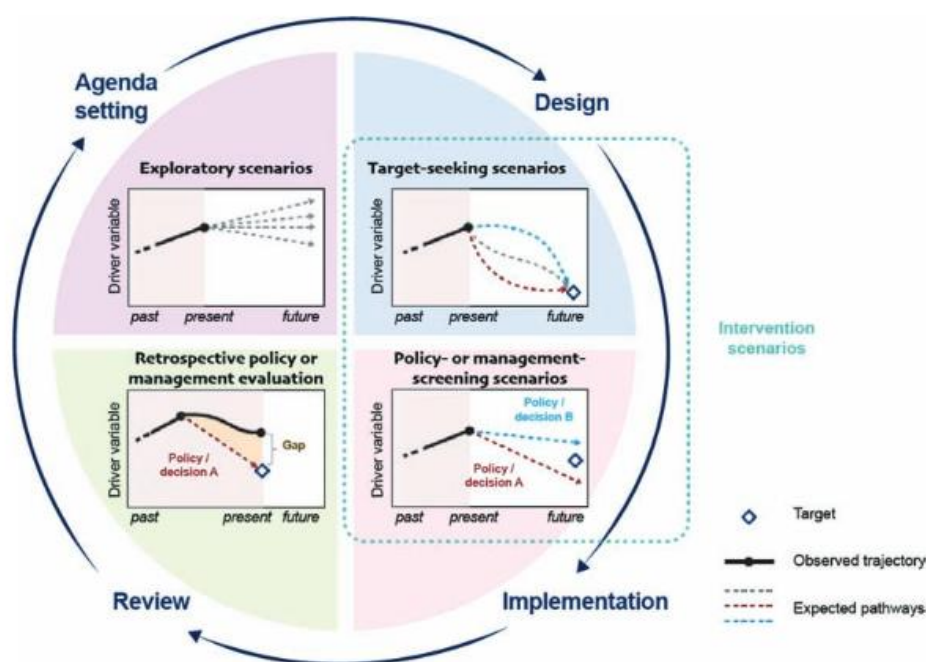
*Figure 1 The four types of scenario relevant to policy making according to IPBES and the Biodiversa/Belmont Forum. In **exploratory scenarios** the dashed lines represent different plausible futures, often based on storylines. In **target-seeking scenarios**, the diamond represents an agreed-upon future target and the coloured dashed lines indicate scenarios that provide possible pathways for reaching this target. In **policy/management-screening scenarios**, the dashed lines represent various policy options under consideration. In **policy evaluation scenarios** (retrospective policy evaluation), the observed trajectory of a policy implemented in the past (black lines) is compared to scenarios that would have achieved the intended target (dashed line). Adapted from Goudeseune et al. (2020).*

Table 1. The four biodiversity scenario types according to IPBES. Adapted from Goudeseune et al. (2020).

	Use	Explanation
Exploratory scenarios	**Awareness-raising, problem identification and agenda-setting** Answer questions such as: *What could happen to biodiversity under future societal and environmental changes?*	They stimulate creative thinking to examine a range of plausible futures, based on potential trajectories of direct (e.g. climate change, pollution) or indirect (e.g. demographic factors, technology developments) biodiversity drivers.
Target-seeking scenarios	**To design interventions to reach specific goals** Answer questions such as: *What are the possible pathways to reach our goal?*	They focus on pathways for achieving a clearly defined future goal. They are valuable for examining the viability and effectiveness of alternative pathways to a desired outcome.
Policy- or management-screening scenarios	**To implement interventions** Answer questions such as: *What would happen if other intervention options were considered?*	They consider various policy or management options and are used to forecast the effects of alternative policy or management interventions on biodiversity outcomes.
Policy evaluation scenarios	**To evaluate previous interventions**	The trajectory of a past policy is compared to scenarios that would have achieved the intended goal. The outcomes of previously adopted

	Answer questions such as: *Have the interventions achieved the anticipated outcomes and goals?*	policies/practices are compared to hypothetical or alternative policies/practices.

3. The SSP-RCPs

Shared socio-economic pathways (SSP) are a set of narratives developed by a group of climate researchers to describe *"plausible alternative trends in the evolution of society and natural systems over the 21st century at the level of the world and large world regions"* (O'Neill et al., 2014). Although they were originally designed with challenges to climate mitigation in mind, they have broad use as agenda-setting tools because they take us from the present through a set of plausible futures.

There are five SSPs, named using terminology on roads to emphasise that they describe development trends over time not a static snapshot at a particular time (O'Neill et al., 2017; Figure 2*)*:

- *SSP1: Sustainability – taking the green road*
  The world shifts gradually, but pervasively, toward a more sustainable path, emphasising more inclusive development that respects perceived environmental boundaries.
- *SSP2: Middle of the road*
  The world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns.
- *SSP3: Regional rivalry – a rocky road*
  A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues.
- *SSP4: Inequality – a road divided*
  Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to increasing inequalities and stratification both across and within countries.
- *SSP5: Fossil-fuelled development – taking the highway*
  Driven by the economic success of industrialised and emerging economies, this world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development.

There are full descriptions of the scenarios in O'Neill et al. (2017). The SSP scenarios can be down-scaled to produce social and environmental scenarios for individual nations or shared oceanic areas.
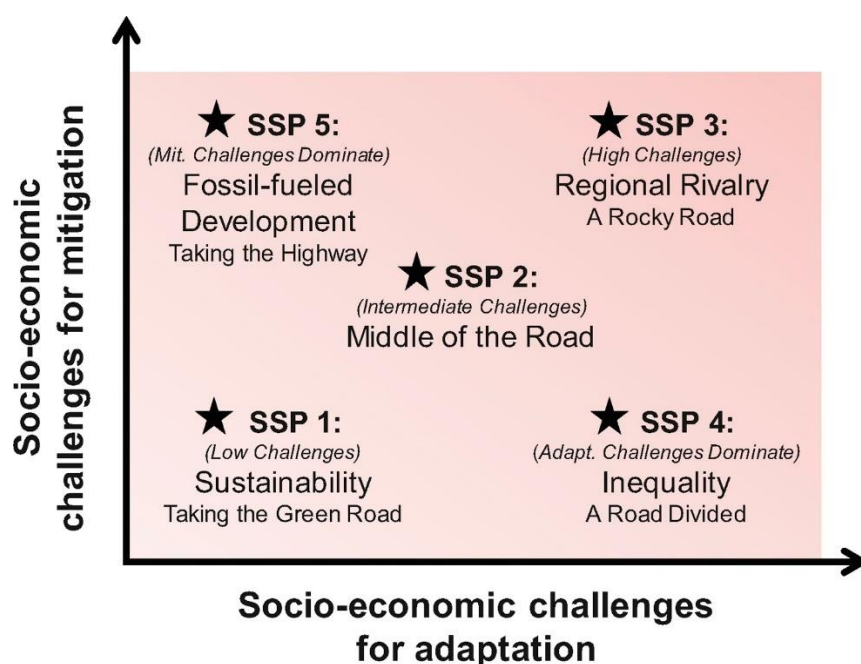
Figure 2 The five shared socio-economic pathways (SSPs) designed to consider different combinations of challenges to climate mitigation and adaptation. From O'Neill et al., (2017)

Representative concentration pathways (RCP) were developed by the IPCC as part of their climate assessment process. They describe greenhouse gas concentrations, aerosol emissions and land-use pattern time-series derived from models to the year 2021 (IPCC, 2021 Table 1.4).

The RCP used in the IPCC's 6th assessment are (from IPCC, 2023 Cross-section Box 2):

- RCP 1.9: very low greenhouse gas emissions
- RCP 2.6: low greenhouse gas emissions
- RCP 4.5: intermediate greenhouse gas emissions
- RCP 7: high greenhouse gas emissions
- RCP 8.5: very high greenhouse gas emissions

In their 6th assessment, the IPCC has combined the greenhouse gas concentrations, aerosol emissions and land-use patterns from the RCP with the socio-economic futures from the SSPs (IPCC, 2021). These are known as the 'SSP-RCPs'. The SSP-RCPs replace older climate emissions and social change scenarios developed by the IPCC in the Special Report on Emissions Scenarios (known as the 'SRES scenarios' or the 'SRES storylines'; Nakicenovic et al., 2000)).

4. How are scenarios created?

There are two main approaches to scenario development and these are *expert-based approaches* and *participatory approaches* (see IPBES, 2016). Participatory approaches involve a group of stakeholders sharing ideas and collectively developing scenarios via meetings and workshops. Expert-based approaches use (formal) expert opinion to derive the scenarios, based on individual knowledge in a particular subject area and/or empirical data. Techniques for collating the expert knowledge include 'informed qualitative ranking through expert opinion' and the 'Delphi technique' (Perveen et al., 2017).

4

The PESTLE (or PESTEL) conceptual framework can be used to help develop the scope of scenarios (Pinneger et al., 2021). This involves describing the possible *political*, *economic*, *social*, *technological*, *legal* and *environmental* conditions in the future. When used with the SSP scenarios described in Section 3, the scenario writers - either individually or in groups - imagine what the political, economic, social, technological, legal and environmental conditions might be in nations/regions in the future for one or more of five scenarios of (SSP1) sustainability, (SSP2) middle of the road, (SSP3) regional rivalry, (SSP4) inequality and (SSP5) fossil-fuelled development.

Another approach for framing scenarios is to apply the 10-tenets concept, which considers (1) social desirability, (2) ecological sustainability, (3) economic viability, (4) technological feasibility, (5), legal permissibility, (6) administrative achievability, (7), political expediency, (8), cultural inclusivity, (9) ethical defensibility and (10) communicability (Barnard and Elliott, 2015). This approach lends itself well to target-seeking and policy-screening scenarios that aim to identify pathways to achieve a desired environmental goal.

5. Using worldviews in scenario creation

Worldviews are the system of values and beliefs shared by groups of people. They use them to make sense of the world they live in, and they represent the human bias for understanding nature and the individual's participation in social life. These perspectives represent the lens through which people see the future (Figure 3). These four perspectives vary through two axes: the axis 'group' defines the degree to which individual choice is bounded by the group and 'grid' describes the degree to which an individual life is limited by externally imposed conditions, and thus the degree to which it is open to individual negotiation (Thompson, 1997).

Broadly, the four worldviews are:

In an **egalitarian perspective** people understand nature as fragile, an entity that needs attention and caution; any mistake can lead the ecosystem to an undesired state or collapse. They usually consider the precautionary principle as a good solution to human-nature problems.

The **individualist's perspective** sees nature as benign in meaning that it can take care of itself, independent of human use or abuse. If free markets (unrestricted competition between privately owned businesses) could operate with minimal restrictions, prices would control scarcity and environmental degradation, and the surplus would provide the economic capital necessary to solve environmental challenges.

The **hierarchist perspective** sees nature as fragile or tolerant depending on thresholds that must be managed properly by qualified personnel. It is crucial to have trained specialised people to investigate the limits of nature, as wise guidance can show the path towards a desired future.

The **fatalist perspective** sees nature as without rhyme or reason. As for this group a lack of understanding of mechanisms and lack of power to take decisions and participate in the management of the social life are blatant, they cope when change there is a change in their environment.
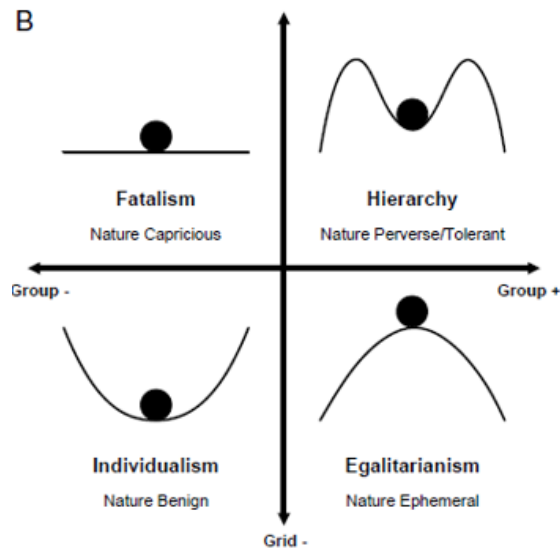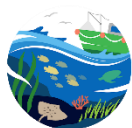
Figure 3: Worldviews typology. Hierarchy, Individualism and Egalitarianisms are the most politically active types; Fatalism is not active. From Chuang et al., (2020).

Incorporating worldviews into marine research has revealed the relevance of perspectives when pursuing social goals in ecosystem-based management (Oliveira, 2022) and in developing co-management options that incorporate conflicting perspectives on marine protected area management (Halik et al., 2018). Taking these worldviews into account during scenario development can maximise the chance of the resulting scenarios representing a future with which everyone can identify.

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