Chapter 19

# Outlooks in GEO-6



**Coordinating Lead Author**: Ghassem R. Asrar (Pacific Northwest National Laboratory, United States of America)

**Lead Authors**: Paul Lucas (PBL Netherlands Environmental Assessment Agency), Detlef van Vuuren (PBL Netherlands Environmental Assessment Agency), Laura Pereira (Stellenbosch University Centre for Complex Systems in Transition), Joost Vervoort (Utrecht University)

**Contributing Author**: Rohan Bhargava (Utrecht University)

**GEO Fellow:** Semie Sama (Centre for International Governance Innovation)

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# Executive summary

**For environmental assessments to be useful to decision makers, they should account for the interactions, interdependencies and co-evolutionary pathways of human-Earth systems in proposed policy options and scientific and technological solutions – including the direct effects and the co-benefits and/or trade-offs.** (*established, but incomplete*). Global Environmental Assessments generally rely on model-based quantitative scenarios. While these models capture many important linkages, the social dimension is not very well represented. Moreover, it is difficult in global assessments to capture important details that are pertinent for local-level decision-making. A systemic and integrated approach is needed in scientifically based environmental assessments and future outlooks, in support of policy and investment decisions, to account for the highly complex, interdependent and continuously changing factors in assessing the human-Earth system changes {19.1}.

**Global assessments have to shift the focus from what is happening and what could be done, to how trends and trajectories in development can be changed** (*well established*). The use of top-down and bottom-up methods in Part C of GEO-6 – Outlooks and Pathways to a Healthy Planet for Healthy People is intended to provide science-based information for this purpose. The combined quantitative scenarios and participatory approaches also offer great potential to be more responsive to meeting the sector- and region-specific information required by decision makers. Therefore, the GEO-6 outlook analysis/assessment use: (1) model-based scenario analysis (generally referred to as the top-down approach); (2) information and knowledge from past and present initiatives, opportunities and trends (i.e. seeds of change); and (3) information resulting from integrative decision-making and participatory activities that are usually conducted at the local to regional levels (generally referred to as bottom-up approaches). This will ensure greater engagement of stakeholders in knowledge development and dissemination, and implementation of resulting policies and practices in a timely manner for greater success {19.2, 19.3}.

## 19.1 Introduction

Parts A and B of the sixth Global Environmental Outlook (GEO-6) indicate that the current global development trends and their future trajectories are not sustainable. At the same time, nations worldwide have agreed on a set of ambitious goals as part of the United Nations 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs), a broad range of multilateral environmental agreements and other frameworks. Together, they aim for halting environmental degradation and aim to enable better development pathways that can benefit both humans and the ecosystems that support human well-being.

The key questions now are whether future trends would lead to the achievement of these ambitious goals and thereby a more sustainable future – and, if not, what would be required, both in policy and practice, to bend the trend towards positive and sustainable development pathways. Part C of GEO-6 aims to provide an integrated and holistic view of the scientific information to address these questions. It presents new approaches to developing science-based information for decision makers, by combining scenario-based quantitative projections (defined here as top-down approaches) with grass-roots and participatory methods (bottom-up) approaches.

## 19.2 Important elements of future-oriented environmental outlooks

Changes in Earth-human systems, and their cascading effects, transcend a wide range of scales of space (i.e. local, national, regional, global) and time (seasons, years, decades and longer), and vary significantly in different sectors (agriculture and food, water resources, energy systems, fisheries, etc.). Such complexities need consideration, through the active engagement of stakeholders and decision makers, in the design, development and implementation of environmental assessments and outlooks. This is because of the interrelationships among, for example, the following:

i. the choices for addressing legacy issues and current pressures (e.g. food-water-energy security),
ii. the development of management approaches that are responsive to a changing environment (e.g. SDGs and other targets) and,
iii. the extent to which emerging issues and future pressures are anticipated and prepared for.

Environmental assessments and outlooks should also consider the potential impact of proposed plans, policies and practices, and the need for improved communication between policymakers and the public. This requires consideration of the decision makers' needs much earlier in the assessment process. The expanding role of public, private and non-governmental organizations in the assessment process allows an intrinsic connection between environmental sustainability and equity, and enables the promotion of sustainability goals through this engagement (Simson 2012; Ho *et al.* 2013). The process of environmental assessment often has difficulty taking account of the socioeconomic impacts of development activities and issues associated with, for example, biodiversity, human health and cultural norms. These were not usually taken into account in the past (Mahboubi, Parkes and Chan 2015; Reid and Mooney 2016; Kok *et al.* 2017). The effectiveness of environmental assessments should be evaluated against the ability to raise the level of the environmental values that are considered important by stakeholders, such as stewardship, services and socioeconomic factors (Arts *et al.* 2012). Furthermore, investigation of effectiveness should explore whether the assessment process and products have resulted in better decision-making and the achievement of the desired outcomes (Fischer and He 2009).

Recent agreement and frameworks – including the 2030 Agenda for Sustainable Development and the Paris Climate Agreement – recognize the need for a change in the current trends and direction, and the need to promote a systemic and integrated approach to assessing the highly complex, interdependent and continuously changing factors that underpin these trends, including the states and dynamics of human-Earth systems. To achieve goals related to biodiversity, for example, one also needs to take account of goals related to food production, water availability, climate change and air pollution. Decision makers can benefit from science-based assessments of the outlooks that include the direct effects, co-benefits and consequences of the available responses, to avoid unsustainable and risk-prone development pathways (Kowarsch *et al.* 2017). Thus, the emerging global architecture for sustainable development and its governance requires environmental outlooks to take into account the complexities and interlinkages of Earth-human systems for developing a diverse range of policies and pragmatic solutions.

The SDGs offer a framework for such a holistic approach to identifying innovative ways and means for advancing human well-being and health together with environmental stewardship (Dye 2018). This framework requires interdisciplinary as well as multidisciplinary scientific research and assessments to be the norm; for the urgency of short-term needs and actions to be balanced strategically with the long-term risks in resource planning and allocation; and for more collaborative and participatory approaches to be promoted, to engage governments, businesses and citizens to reconsider their roles, responsibilities and contributions to the implementation of multilateral environmental agreements (Simson 2012; Ho *et al.* 2013). Stakeholder engagement could, for example, be an integral part of business development to bring the three aspects of sustainability – environment, society and economy – to the heart of societal value creation.

Specifically, environmental assessments and outlooks should identify the transformative interventions needed to achieve sustainable development pathways towards the stated goals/targets (e.g. SDGs), to ensure a healthy planet for healthy people. Such transformations must consider the role of humans in the form of socioeconomic development, the roles of the perturbations of natural systems and built systems, such as infrastructure, and also the interactions and interplay among these roles.



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## 19.3 A new framework for combining top-down and bottom-up analysis methods

Various methods have been developed over the past decades to conduct environmental assessments and outlooks in support of decision-making. Model-based scenario analysis, for example, has been used as a method to define plausible future conditions, in relation to the current state and trends in socioeconomics, technologies, environmental conditions and policies (van Vuuren *et al.* 2012). In this approach, an envisioned scenario is a plausible and often simplified description of how the future may take shape, based on a coherent and internally consistent set of assumptions about key driving forces and their relationships (Millennium Ecosystem Assessment 2005). As such, scenarios are powerful tools that can help to conceptualize how alternate futures might unfold. They provide insight on where alternative pathways for sustainable development might lead us by taking into account the many interrelations between different subsystems (e.g. energy, agriculture, cities, etc.) and societal concerns (health, economy, climate, air, freshwater, biodiversity, etc.), thereby specifically addressing synergies and trade-offs between different developments and aspirations. Given the inherent uncertainty about the future, scenarios and associated analyses are also helpful for both assessing the future implications of different problems and inspiring the narratives around which decisions are made (with due consideration given to the level of confidence in their certainty and their likelihood of success). This approach is also referred to as the top-down approach and it usually starts with the consideration of a given policy and traces the causal chains expected by its implementation (see Chapters 21 and 22). It offers the opportunity to evaluate the potential effectiveness of the policies under consideration by evaluating the quantitative representation of the various systems involved, the interlinkages between them as much as possible, and the creativity used to represent these complex systems, often based on the current state of knowledge about them.

In contrast, the increasingly prominent participatory approaches, also known as bottom-up approaches, begin from the observed outcomes and trace the causality back to the policy interventions (see Chapter 23). Most of these approaches are based on the active engagement of stakeholders and citizens through workshops, crowdsourcing and competitions to identify innovative ideas, practices and solutions. The identified needs being answered are often sector- and region-specific, resulting in an evolution in the diversity of participatory approaches over the past decades. The greatest advantages of bottom-up approaches are threefold:

i. they focus on specific local and regional development challenges,
ii. they engage stakeholders and users in planning the intended analysis, and in the resulting knowledge for its design, development and implementation, and,
iii. they provide the ability to develop sector- and/or region-specific analysis and information.

The bottom-up approaches do have some limitations, such as their limited ability to be extended to larger scales, and their limited sustainability over time. They nonetheless offer significant potential considering the rapidly increasing needs for information for decision makers at local and subnational levels, and the desire to engage stakeholders actively in the knowledge-development process (Jabbour and Flachsland 2017; Kowarsch *et al.* 2017).

GEO-6 therefore uses both top-down and bottom-up approaches and methods towards target-seeking scenarios. This builds on the assessments in previous GEOs and pre-SDG pathways analysis and is based on quantitative scenarios (van Vuuren *et al.* 2015; see also Chapters 21 and 22) and on the participatory and grass-roots analysis that has been conducted through stakeholder workshops and crowdsourcing approaches (see Chapter 23). This opportunity to combine the desirable attributes of different approaches offers great potential for assessments and outlooks to capture the increased complexities of Earth-human systems and their interlinkages, and to be responsive to decision makers' needs for sector- and region-specific information. Some new features of the outlook analysis provided by GEO-6 are:

- A combination of top-down (e.g. pathways and trajectories) and bottom-up (or participatory) approaches (e.g. game changers, effective seeds and crowdsourcing) to ensure the efficacy and effectiveness of the resulting analysis.
- A focus on the 'how' question in integrated scenario analysis, by explicitly discussing target-seeking scenarios and linking them to the evolution of the pathway experience in the literature, with specific attention given to the synergies and trade-offs in simultaneously achieving well-being and environmental goals.
- The engagement of stakeholders in knowledge development, implementation and dissemination – through regional and sectoral stakeholder workshops and crowdsourcing platforms, for input into analysing, testing and refining the outcomes.
- Communication with decision makers (e.g. policy experts) throughout the knowledge-development process, not just in the final product, and using innovative means for communicating assessment outcomes, to increase their uptake in policy and practical decision-making.

The global top-down pathways considered in GEO-6 are based on a review of existing work, and can be grouped in three potential pathways that can drive change (PBL Netherlands Environmental Assessment Agency 2012; van Vuuren *et al.* 2012), namely:

i. technological innovations, which can serve as the dominant reason for change,
ii. shifts in consumer choices and behaviour, and,
iii. decentralized innovation in favour of more localized and community-level activities.

The bottom-up approaches evaluated in GEO-6 capture the richness of practices, ideas and visions for desirable global futures using a variety methods –examples include the Climate CoLab platform from the MIT Center for Collective Intelligence (Malone *et al.* 2017), initiatives dubbed the "seeds of a good Anthropocene" (Bennett *et al.* 2016), and the pathways projects sponsored by the European Commission's Seventh Framework Programme (Kok *et al.* 2015; see Chapter 23). The combined approach offers the potential to develop the required science-based analysis for the successful implementation of the SDGs, together with that of other multilateral environmental agreements (European Commission 2016; Patterson *et al.* 2017).

## 19.4 The role of scale

Scales plays a key role in environmental assessments (Gibson, Ostrom and Ahn 2000; Cash *et al.* 2006; Vervoort *et al.* 2012) because most environmental problems transcend a wide range of levels (i.e. across local, national, regional and global). The idea in that broad societal changes -which is described as the landscape level- can create opportunities for non-mainstream, radical practices and technologies at the niche level to replace the old social and technological mainstream practices at the regime level – the status quo in a specific domain of social and technological activity (Geels and Schot 2007). Many other theories of transformation applied to social-ecological systems share this general idea that some interplay between bottom-up change created by niche practices and top-down changes created by broad societal shifts, by changes in policies and economic activities, lead to transformation (Feola 2015; Patterson *et al.* 2017).

This can be illustrated for climate change and its impacts. First, the biophysical process plays out at different levels: global ($CO_2$ concentration), continental (weather patterns) and local (land-climate interactions). Second, levels also play a key role in terms of solutions. While, for example, international climate policy is negotiated at the global level, it needs to be implemented at the national and local levels. Connections across levels should therefore be a major consideration in environmental assessments and outlooks, and in recommended policies and actions (Zurek and Henrichs 2007). Mismatches between the levels of human-built and natural systems can lead to negative environmental impacts, for example, when a river basin falls under competing national jurisdictions (Cumming, Cumming and Redman 2006).

Integration across scales plays a significant role towards identifying synergistic and effective policies and actions (Palazzo *et al.* 2017). For example, the identification of concrete policy recommendations should consider what policy conditions have to be created (by governments, the private sector, civil society and others) to allow innovative bottom-up processes to flourish by scaling up to higher levels and deeply in future  assessments (Moore, Riddell and Vocisano 2015; Mason-D'Croz *et al.* 2016). This implies that decision makers in different sectors receive useful information for formulating and implementing policies, strategies and investments that facilitate transformative change in their sector and area of interest.

The complementary features the top-down and bottom-up approaches being used in Part C allow the consideration of scales and their interactions in the evaluation of scenarios and strategies, by maximizing the synergies and, as much as possible, minimizing the trade-offs among them for potential pathways to achieving SDGs and other multilateral environmental agreements.

## 19.5 Roadmap for Part C of GEO-6

Building on previous assessments, particularly on GEO-5 (United Nations Environment Programme [UNEP] 2012), the focus of GEO-6 has shifted to a combination of the 'what' and 'how' questions, and the required approaches, to assess the state of scientific knowledge on the challenges and opportunities associated with global goals and targets. A universal, transformative and integrated agenda for sustainable development is now available in the form of the 2030 Agenda for Sustainable Development (without it being explicit about this), to allow the goals of a broad range of multilateral frameworks and agreements to be brought together in a more coherent manner. Part C seeks to address the synergies (co-benefits) and trade-offs (competing aspects) in achieving the multiple goals and targets of these frameworks and agreements (e.g. SDGs, Nationally Determined Contributions, Aichi biodiversity targets), rather than analysing how to achieve their many individual indicators separately. The guiding questions are:

- How can we achieve the environmental dimension of the SDGs and related multilateral environmental agreements?
- What mid- to long-term strategies are needed to achieve lasting sustainability?

The aim of the outlook chapters of GEO-6 (Part C of this report) is to address these questions by combining top-down, model-based scenario analysis with information resulting from bottom-up and participatory initiatives (see Section 19.2). The purpose is to illustrate how these can be used together towards meeting the information needs of decision makers at national and subnational as well as regional and global levels.

The following key elements are addressed in subsequent chapters:

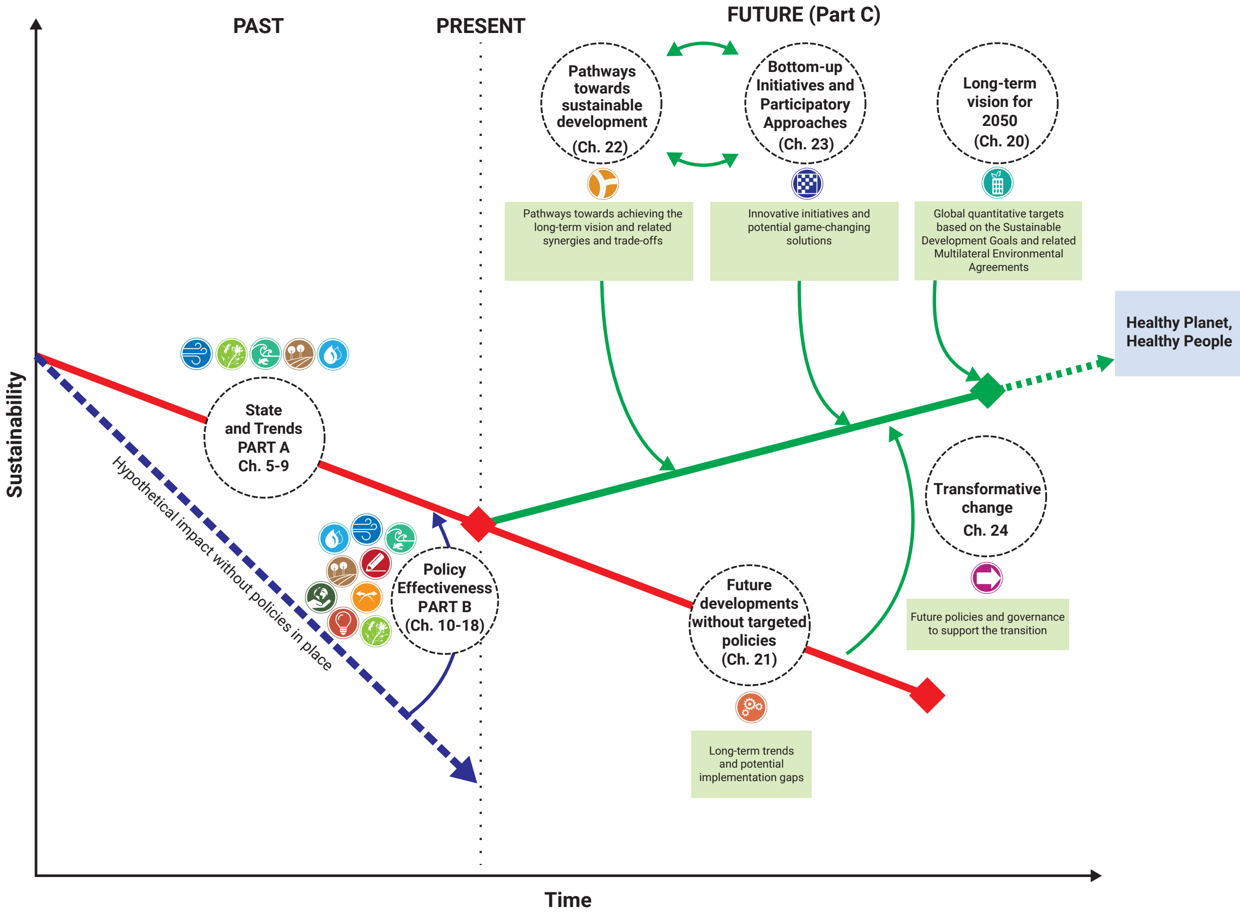
- Formulating a quantitative long-term vision for 2050, consisting of key environmental targets from the SDGs and related multilateral environmental agreements (Chapter 20)
- Assessing long-term trends and discussing the potential implementation gaps (Chapter 21)
- Identifying potential pathways for achieving the long-term vision, with a specific focus on the many interrelations across the broad range of targets assessed (Chapter 22)
- Assessing innovative initiatives and game-changers in the context of future pathways (Chapter 23)
- Discussing the way forward for moving towards the theme of GEO-6 of healthy planet and healthy people (Chapter 24).

Chapter 20 translates the mid- to long-term vision of the SDGs and a few related multilateral environmental agreements into a more concise and quantitative formulation of targets, focusing on the food-water-energy nexus. This includes extracting the available information from these frameworks and agreements, selecting some key environment-related priorities in relation to healthy planet, healthy people and identifying indicators and quantitative target levels to track progress. Chapters 21 and 22 assess the model-based scenario literature (i.e. the top-down approach) to discuss current trends in Earth-human systems, and pathways towards achieving the long-term vision, respectively. No new scenarios were developed, and the analysis and assessment are based on existing scenarios (e.g. shared socioeconomic pathways). In Chapter 21, the scenario analysis focuses on current trends and identifies the potential implementation gaps between these and the targets identified in Chapter 20. Chapter 22, in contrast, identifies pathways that can achieve the selection of targets in a complementary and holistic way. Together, the three chapters provide a solutions-based perspective, including possible trade-offs and synergies for the identified pathways.

Chapter 23 focuses on the gap between current trends and the sustainable pathways based on grass-roots and participatory approaches that engage stakeholders and citizens (i.e. the bottom-up approach). Similar to the model-based scenarios, a combination of existing and future initiatives and best practices is identified that could help in achieving specific and combined SDGs and their targets. A major strength of this approach is that it takes into account the role of different actors. This type of analysis can be carried out by using the top-down scenarios to frame the bottom-up initiatives. Such framing will help to overcome the major challenges relating to the so-called game-changing and bottom-up strategies that are often specific to geographical areas and/or sectors, to evaluate their feasibility and benefits at the global level.

Finally, Chapter 24 presents the information resulting from the proposed integrative and holistic approaches examined across Part C that can contribute to the development and implementation of effective policies and practices towards achieving the SDGs and multilateral environmental agreements synergistically. In short, how they can contribute to transformative development pathways for a healthy planet, healthy people.

**Figure 19.1: Conceptual framing of the chapters in Part C of GEO-6, how they are related, and how they contribute to a holistic analysis and assessment of human-Earth systems that identifies transformative development pathways**




*Source:* Adapted from van Vuuren *et al.* 2015.





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