Opening up Anthropocene futures: integrating pluralistic, practice-based bottom-up scenarios into global environmental assessments

A comparative study between the sixth Global Environment Outlook and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

MSc Thesis
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Summary

Global analyses on the state of the environment for use in policy making are provided by global environmental assessments (GEAs). Two major examples of such GEAs are the Global Environment Outlook (GEO) and the recently established Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Their assessments typically include 'outlook' sections, where scenarios form a set of possible futures that can inform policy. Usually these scenarios are based on global-level projections developed using quantitative models that provide limited room for including the diversity found in local and national contexts – both in terms of local or at least sub-global concerns, and in terms of potentially transformative practices that could contribute to desirable global futures. Without such bottom-up input, global futures run the risk of being too abstract to be useful to policy makers at other levels as well as provide limited options of transformation potential. This thesis investigates ways to create a role for bottom-up scenarios in global environmental assessments in combination with global modelling. In a comparative study between GEO-6 and IPBES, which are both innovating around this integration, I examine the influence of the governance (i.e. key actors, decision-making processes, and level of stakeholder participation) of scientific assessments on prevalent disciplinary perspectives in GEAs. In addition, I looked into how these factors determine the perceived value of legitimacy, salience and credibility by GEAs. As such, the governance as well as disciplinary perspectives influence the potential role of bottom-up scenarios in GEAs. Semi-structured interviews are conducted with experts from GEO and IPBES. In addition, I will report on insights from my own involvement as a participating researcher in the GEO-6 process during this study.

The research in this thesis demonstrates that governance factors and disciplinary perspectives strongly influence success or failure in the integration of bottom-up scenarios in GEAs. Among others, high-level actors deciding on who gets nominated, which knowledge is perceived as relevant, and the extent to which the process experiments with innovative methods turn out the most important factors. Another influence is the extent to which processes are open and transparent, as this determines the level of collaboration with other GEAs. Benefits are co-learning processes and increased resource capacity – all requirements for an effective implementation process of the bottom-up approach. Also within the process, communication seems to be key to transfer innovative ideas and convince high-level actors. The current lack of effective communication due to a limited number of meetings as well as different perspectives and 'languages' used constrain attempts by authors to effectively transfer the value of bottom-up scenarios to higher levels. Furthermore, it seems that although GEAs acknowledge the need for more legitimacy and salience, they experience constrains in the implementation of the bottom-up approach due to its deflected nature. Bottom-up scenarios increase legitimacy as well as salience of the process, however, they do not reflect credibility yet – which is still the most important value for GEAs. If high-level actors act along the formulated objectives and support this novel approach - the bottom-up team can publish primary material to make it scientifically sound. This thesis contributes key insights to help GEAs make the integration of bottom-up scenarios more feasible.

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1. Introduction

The world of today is facing several major Anthropogenic challenges such as climate change, food shortage and water scarcity. Since these issues transcend boundaries and their future development is uncertain and complex, international policies and adaptation strategies are required to cope with them systematically (Vervoort et al., 2014; Rotmans & Loorbach, 2009; Tengö et al., 2017). Intergovernmental action to reverse or at least limit the consequences of devastating trends driven by humanity, resulted in the agreement on several desired paths to sustainable development. Examples are the 17 Sustainable Development Goals (SDGs) agreed upon in 2015 as part of the 2030 Agenda for Sustainable Development; the Paris Climate Agreement; and the Convention on Biodiversity (Lucas, Ludwig, Kok & Kruitwagen, 2016; UN Environment, 2018a).

Global environmental assessments (GEAs) play an important role as knowledge provider in this global tendency towards sustainable development, as they estimate and evaluate scientific evidence of human impacts on the environment. As such, they can be described as global orchestrations of scientific knowledge that can be used as foundation in policy responses to Anthropogenic issues (Brooks et al., 2016; UN Environment, n.d.-a). Besides descriptive assessments on the state of the environment based on the past; GEAs typically include an outlooks chapter in which current trends are extrapolated to the future, serving as guidance for short to longer term (environmental) policy and decision making (Kok et al., 2015; Vervoort et al., 2014). They contain several global pathways developed from a diverse set of scenarios that have been collected from all around the world. Mostly explorative scenarios made by quantitative models, also called 'top-down scenarios', are used to simulate different directions for global trends (e.g. population growth, temperature rise, hunger). As such, they can estimate future gaps between extrapolated trends and sustainability goals agreed upon in intergovernmental agreements. Although models can show what is needed to close this gap; these problem-oriented analyses do not provide options on how it can be achieved (UN Environment, 2018a).

For more than two decades (the first global IPCC assessment on climate change was launched in 1990), GEAs have been using the top-down approach to envision future environmental trends. However, since a couple of years even the IPCC, which is considered the most comprehensive GEA, has been criticized on solely describing environmental issues (Beck et al., 2014). This relates to the increasing scientific and societal recognition that the environment, ecosystems and the services they provide, are under alarming threat. As a consequence, the responsibility to act is not any longer perceived as the task of a small group of actors only but is now widely supported by a broader range of societal stakeholders. The growing awareness on the urgency for transformational change towards a more sustainable future has implications for GEAs, since there is an increasing demand for solution-oriented information by potential end-users such as sub-global policy makers and NGOs. This however requires a significant shift by GEAs from their traditional strategy of producing credible, objective assessments (Van der Hel & Biermann, 2017). They are forced to reconsider their role in the science-policy interface in order to keep their authority and need to think about

ways to produce relevant knowledge for multiple stakeholders (i.e. foster salience), which requires better representation of the world's diversity in terms of people, practices and perspectives (i.e. increase legitimacy).

For GEAs to be able to identify transformative pathways and ways to get there, it requires a variety of toolkits beyond models. What is specifically missing is a new way of thinking about the future that accounts for more legitimacy and salience through considering various existing local, regional and national practices, values, visions and worldviews of different geographical regions; covered by 'bottom-up scenarios' (Bennett et al., 2016). Patterson et al. (2017, p.11) characterize this bottom-up approach as "inclusive, pluralistic and dynamic, iterative and dialogue-based […]". Whilst it is difficult to downscale information from top-down scenarios to fit local contexts; when combined, top-down and bottom-up scenarios can complement each other and offer more comprehensive and useful knowledge to local and national end-users, which will be better able to relate to diverse and inclusive scenarios. It is particularly important to include multiple knowledge systems since the majority of the Earth's surface is managed by indigenous people and local communities. Their support is indispensable for achieving a sustainable future (Bennett et al., 2016; Tengö et al., 2017).

1.1. Research objective, research questions and framework

Although there is a growing societal need for more useful and representative assessments, as well as responsive claims of GEAs to meet those demands; they struggle with translating their ambitions in significant actions. Bottom-up scenarios that represent different people and perspectives from a more solution-oriented angle collide with the traditional, vested organization culture and strategy that focus on producing objective assessments. Different governance factors and disciplinary perspectives are therefore important to consider in understanding the absence of bottom-up scenarios in GEAs. This thesis examines how these organizational conditions and beliefs influence GEAs' understanding of legitimacy, credibility and salience, and examines which factors constrain the inclusion of bottom-up scenarios. As such, the aim of this study is to provide insights on the conditions that influence the potential use of bottom-up scenarios in combination with top-down scenarios, by comparing two GEAs. Hereby, this study can support GEAs to reflect on their internal process and the impact they have on the ability to produce relevant, representative knowledge that fits their formulated objectives. The main research question that this study seeks to answer is:

How do governance factors and disciplinary perspectives in global environmental assessments influence the role of bottom-up scenarios?

The timing of this study enables GEAs to already consider changing necessary aspects in order for the bottom-up approach to be implemented in the next round of assessments, which will be in about four to five years from now. Therefore, in the discussion recommendations are given on more favourable conditions for using bottom-up scenarios by GEAs.

To answer the main question step by step, three sub questions are developed. The first focuses on the organization structure of GEAs by exploring the leading actors, decision-making processes and forms of social interaction within the process as well as with external stakeholders (Driessen et al., 2012). These and more governance factors largely determine dominant disciplinary perspectives of GEAs. The first sub question is as follows:

> *1. How do governance factors influence the role of different disciplinary research perspectives in global environmental assessments?*

The influence of disciplinary research perspectives reflects in the formulated objective(s) of the GEA, as well as in the decision on what is perceived relevant knowledge. These and other factors are important to examine as they influence the dominant perception on the value of bottom-up scenarios. The second sub question is:

> *2. How do different disciplinary research perspectives value the role of bottom-up scenarios in global environmental assessments?*

Together, the way of governance and disciplinary perspectives largely determine the degree to which GEAs value salience, credibility and legitimacy (Cash et al., 2003). For instance, the governance structure and disciplinary perspectives can be suitable for the inclusion of bottom-up scenarios, however, if credibility is strongly prioritized over legitimacy to multiple stakeholders, they may not seek to include diverse perspectives and knowledge systems. Therefore, the last sub question to be answered is:

> *3. How do governance factors and disciplinary perspectives in global environmental assessments relate to the perceived value of salience, credibility and legitimacy?*

The research framework presented in Figure 1 visualizes the relation between the different research questions, concepts and theory, as well as shows the further outline of this study.
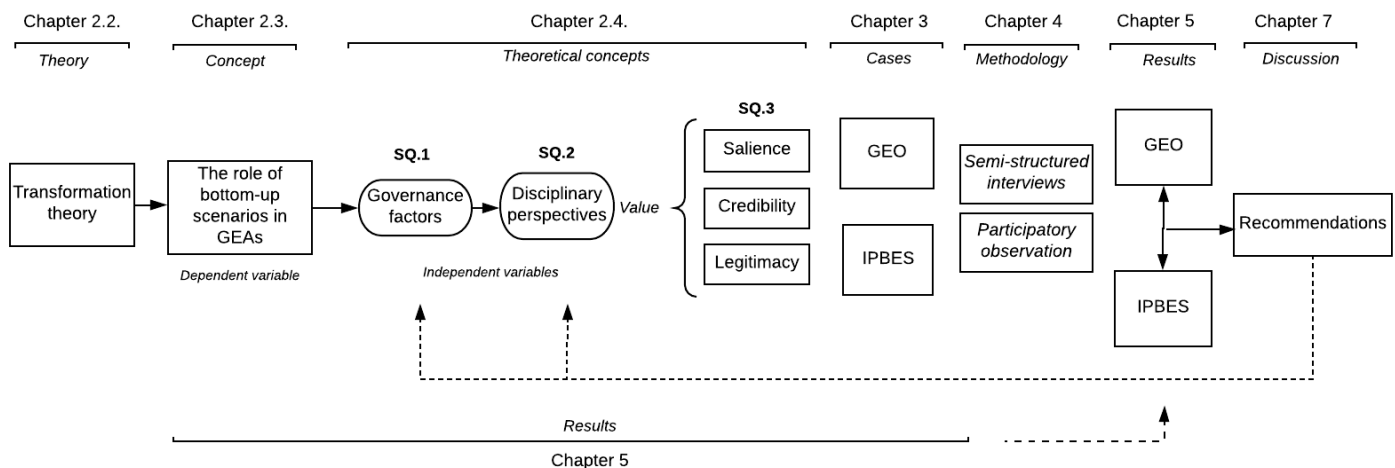
Figure 1. Research framework.

1.2. Societal and scientific relevance

Since the last decade, there has been growing public attention for the impacts that we, as human beings, have on the environment - with climate change as a most prominent sign and to a lesser extent declining biodiversity (Steffen et al., 2011). This societal awareness has created a broad sense of urgency for radical change to happen. From their position in the science-policy interface, GEAs experience an increasing demand of more representative and useful outcomes (Van der Hel & Biermann, 2017). To conduct assessments that better fit local contexts and account for diversity at different scales; scenarios at different levels including multiple actors are needed (Bennett et al., 2016; Biggs et al., 2007; Kok et al., 2017). This is especially important because people base their actions on what they believe and learn about the future environment. Information provided by extrapolated trends that do not take into account existing local sustainable practices, nor transformation potential, are not a particularly accurate reflection of reality. The information communicated with only top-down scenarios may therefore be more bleak than necessary, with all its implications for societal behavior. Multiple innovative and inspiring - yet realistic scenarios that are grounded in the present are therefore needed and should be reflected in policy making (Bennett et al., 2016). Small, scalable actions and practices represented in these scenarios can be supported by multiple actors that together can lead to significant change in the longer term and can be seen as important contributions towards improved earth system governance (Patterson et al., 2017; UN Environment, 2018b).

This study is scientifically relevant as it looks into the changing role of science - specifically foresight - in society. Whereas for decades, GEAs used to be organized in a traditional way to produce objective scientific information; it now seems that these large UN processes are forced to reconsider their organizational functioning. This tendency is however not unique – there is a broader discussion on the authority of environmental scientific institutes and their struggle with turning scientific knowledge into real action (Van der Hel & Biermann, 2017). For GEAs, however, this changing role is fairly new and therefore interesting to explore from a scientific viewpoint.

2. Theoretical and conceptual framework

This chapter starts with a brief elaboration on the need for transformations to occur in order to achieve a more sustainable future. It shows why a new way of thinking is required and explains the role of GEAs in bringing this along. As an example of this new way of thinking, the concept of bottom-up scenarios is discussed. Finally, influencing factors on the implementation process of bottom-up scenarios in global environmental assessments are examined.

2.1. Seeking sustainability in a complex and uncertain future: transformation theory

The Earth's climate, biodiversity and ecosystem services have faced considerable changes over the last two centuries (Bennett et al., 2016; Steffen et al., 2011). Many environmental boundaries have already been passed, meaning humanity takes more than the Earth can provide sustainably (Rockström et al., 2009). Unsustainable practices combined with an overgrowing population are expected to cause irreversible implications, which is why the need for transformational change in socio-ecological systems is broadly supported (Bennett et al., 2016; Hebinck, Vervoort, Hebinck, Rutting & Galli, 2018; Patterson et al., 2017; Steffen et al., 2011). Patterson et al. (2017) describe transformations as complex and dynamic, as they involve change in multiple systems (social, institutional, cultural, political, economic, technological and ecological). Within these systems, transformations can manifest in different units (e.g. organizations, farm practices), patterns (e.g. institutions and social networks), and sectors (energy, food, urban, water) – either abruptly or gradually, and intended or unintended (Feola, 2015; Patterson et al., 2017). Attempts to stimulate such comprehensive change processes towards a healthier environment are even further constrained in an uncertain and complex future (Sharpe, Hodgson, Leicester, Lyon & Fazey, 2016; Rotmans & Loorbach, 2009; Wilkinson & Eidinow, 2008). Transformation scholars that study the potential of radical change to happen indicate that there is a macro-level at which novel emergent structures arise (e.g. transformations towards more sustainability) from the interaction between components at the micro-level (Bennett et al., 2016; Crona & Parker, 2012; Hebinck et al., 2018; Sharpe et al., 2016; Van der Hel, 2016). A better understanding of social system dynamics is therefore required to shape and support broader systems change.

2.2. A new way of future thinking: the role of foresight in transformative change

Researchers have been studying global environmental change for decades, albeit since recently started to use scenario development as a tool to communicate their findings to frame possible futures. Schoemaker (1993) defines scenarios as "focused descriptions of fundamentally different futures presented in coherent script-like or narrative fashion" (p.195). They serve as a scientific information source in policy making and have been used by

governments and other end-users to make sense of uncertain circumstances (Biggs et al., 2007; Ramirez & Selin, 2013; Vervoort & Gupta, 2018). Explorative scenarios examine plausible future pathways, whereas back-casting scenarios focus at a future goal that can be achieved by incremental actions (Hebinck et al., 2018). As such, foresight in general can contribute to change through contextualizing sustainable futures, as well as providing practical steps (Hebinck et al., 2018). However, foresight is largely focused on developing global scenarios from a probabilistic approach using quantitative models. As such, there is limited room for diversity as well as for transformation potential. The consideration of a more constructivist approach in foresight would embrace the fact that there is no single 'right' view, as it would support more inclusiveness as well as account for different ways to achieve sustainability. The aim to use foresight to envision global transformations by using bottom-up scenarios is, however, still new and has not been used at the global level, which provides an opportunity for GEAs that aim to increase their authority in the field (Van der Hel & Biermann, 2017).

2.2.1. Global environmental assessments

GEAs are key actors in navigating the future as they collect and assess diverse sets of existing scenarios and combine them into a coherent narrative (Kok et al., 2017; Vervoort & Gupta, 2018). Traditionally, they produce scientific assessments on the state of the environment but often fail to cope with future complexity and social contexts (Beck et al., 2014; Hebinck et al., 2018; Rotmans & Loorbach, 2009; Sharpe et al., 2016; Vervoort & Gupta, 2018). Often, quantitative simulation tools such as Integrated Assessment Models (IAMs) are used to project global pathways, which have proven to be suitable for offering a robust understanding of the environment and indicating consequences of global change (e.g. temperature rise and population growth) (Biggs et al., 2007; UN Environment, 2018a). Stakeholders involved are usually experts from NGOs, academia and representatives of organizations; whilst the engagement of local communities is limited (Biggs et al., 2007). From now on, this type of scenarios will be referred to as 'top-down scenarios'.

The current issue with top-down scenarios is that they do not take into account social dynamics in global future pathways, something for which bottom-up scenarios can act as complementary. The need for a better understanding of socio-ecological systems to envision transformation potential emphasizes the need for GEAs to consider new participatory modes of knowledge production that involve stakeholders at different levels (Feola, 2015; Patterson et al., 2017; Rotmans & Loorbach, 2009; Van der Hel, 2016; Vervoort et al., 2014). This whole idea is substantiated in the Belmont Forum - a partnership on transdisciplinary research related to global environmental change:

"A step change in coordination and collaboration is required that will ... endeavour to collectively identify priorities, co-design research strategies and co-produce knowledge with users and key drivers of innovation and change, including the policy and business communities" (Belmont Forum, ICSU and ISSC, 2011, in Van der Hel, 2016, p.170).

2.2.2. The concept of bottom-up scenarios and their potential role in GEAs

Bottom-up scenarios are based on the present as they consider niche examples such as existing local practices, ideas and actions that are currently contributing to sustainability (Bennett et al., 2016). They can be seen as reflections of the world's diversity in terms of people, practices and perspectives, and showcase innovations in multiple systems (social, technical, economic, and social-economic). These local tools and practices can be scaled up, deep, and out to different levels and regions; which recognizes the potential and power of niche actors to cause transformations towards a sustainable future (UN Environment, 2018b; Rotmans & Loorbach, 2009). Especially initiatives that provide synergistic solutions in multiple systems promise to be effective in achieving international agreements. Databases of local initiatives, participatory workshops and platforms include diverse perspectives of actors and embrace qualitative data sources, such as indigenous and local knowledge (ILK) (Biggs et al., 2007; Kok et al., 2017), either represented by experts on a specific ILK system (i.e. ILK-experts), or indigenous and local people themselves (i.e. ILK-holders) (Tengö et al., 2017). Examples are the Bright Spots: seeds of good Anthropocenes project, MIT's Climate CoLab, TRANSMANGO, and PATHWAYS (Bennett et al., 2016; UN Environment, 2018a; UN Environment 2018b).

As such, bottom-up scenarios can complement top-down scenarios as they take into account multiple important actors (governance aspects), recognize the potential of different solutions towards sustainable development, and connect them at multiple scales (UN Environment, 2018b). Plural perspectives on messy challenges can provide a more complete overview of possible futures, whilst complemented and verified by the numeric top-down scenarios that account for biases and difficult predictable factors, such as biophysical processes (Bennett et al., 2016; Vervoort et al., 2014).

2.3. Influencing factors on the role of bottom-up scenarios

Bottom-up scenarios are tools that can be used by GEAs to foster their legitimacy and societal relevance (i.e. salience). The application of this approach is however characterized by constrains since the perceived value of legitimacy and salience is socially constructed, which depends on different disciplinary perspectives and worldviews that on their turn are shaped by the way of governance. First, the modes of governance framework of Driessen et al. (2012) is used to deconstruct the organization of GEAs in terms of actors, institutional features and features related to the content. This way of organization shapes dominant disciplinary perspectives in GEAs; which is the second category of influencing factors on the use of bottom-up scenarios. Finally, the framework provided by Cash et al. (2003) is used as a guidance for analysing these organizational conditions and perspectives in relation to the value attached to legitimacy, salience and credibility.

2.3.1. The way of governance

The way GEAs are organized in terms of strategy is shaped by the actors that are either involved in the process or otherwise somehow connected to it. Driessen, Dieperink, Van Laerhoven, Runhaar and Vermeulen (2012) operationalize different modes of governance by

focusing on actor configurations which lead to certain institutions and a specific way of issue framing. The arrangement is reflected in the content of the organization, such as certain goals and preferred methods and tools (Driessen et al., 2012). It is important to consider the way of governance of GEAs as it provides information on actors included and excluded in the process, as well as on who has decision-making power and how these processes are structured; with all its implications for the dominant disciplinary perspectives. This section discusses a (not comprehensive) set of governance factors emphasized by important literature studies.

2.3.1.1. Actor features

High-level actors in organizations like GEAs initiate action, have decision-making power and are able to formulate objectives (Driessen et al., 2012; Van der Hel & Biermann, 2017; Vervoort & Gupta, 2018). For instance, in their position to assign experts to assessment chapters, an emphasis on certain selection criteria (e.g. gender, region, religion, cultural background and age) can significantly affect the process in terms of outcomes and strategy (Van der Hel & Biermann, 2017; Vohland et al., 2011). Criteria that mainly focus on diverse representation can result in a lack of specific skills or expertise in chapters, whereas highly qualified authors may produce sound reports but lack diverse perspectives which can constrain innovation potentials (Van der Hel, 2016). Key actors also determine the level of interaction with other stakeholders in terms of power allocation, participation and communication (Driessen et al., 2012; Vohland et al., 2011). The position of diverse actors in GEAs can be characterized as either autonomous, if they are rather isolated from the process, or more engaged and involved in the organization (Van der Hel & Biermann, 2017).

2.3.1.2. Institutional features

Ways of interaction within and between organizations are predominantly shaped by key actors. GEAs can either have a rigid internal organization structure with clear procedures of planning, interaction and decision-making (characterizing a more centralized governance mode), or a flexible, participatory organization with a more informal culture (Driessen et al., 2012). A process with mostly top-down interaction characterizes limited interactive communication and imposes rather than deliberates; whereas interactive communication provides more room for social learning, collaboration and negotiation (Driessen et al., 2012). Furthermore, consensus-based procedures traditionally characterize a restriction of diversity of voices and options, which constrains the room for manoeuvre and limits innovation. As such, they support incremental chance as the default mode of evolution, rather than encouraging more dynamic and transformational forms of organizational learning (Beck et al., 2014). These internal institutional features also reflect formal contact with other organizations, since collaboration and knowledge sharing with other processes requires a certain level of openness and transparency. It can be stated that the bottom-up approach requires a certain extent of inclusiveness and flexible institutions in GEAs (Van der Hel & Biermann, 2017; Opgenoorth & Faith, 2013).

2.3.1.3. Features concerning content

Configurations of actors operating in institutional arrangements form a certain view on what content the assessment should preferably produce. GEAs can either focus on goals set in international agreements (e.g. the SDGs and Aichi Targets) that are based on scientific evidence; or define their objective in participatory scoping processes with targeted end-users (Thaman et al., 2013). The degree to which multiple stakeholders are engaged in the process improves a sense of commitment to the output and consequently enhances the chance that outcomes are effectively used in policy making, which is particularly important for GEAs if they want to improve their impact and accountability at multiple levels (Van der Hel, 2016). Choices on stakeholder involvement largely depend on the position that GEAs take in the policy-science interface: organizations that are independent advisors and advocates for science focus on what stakeholders should instead of want to hear; whereas for those that operate more in politics this is vice versa. As such, the governance structure strongly influences for whom project outcomes should be relevant and accordingly which disciplines, methods and perspectives should be included, which reflects the extent to which they value legitimacy, salience and credibility (Driessen et al., 2012; Van der Hel & Biermann, 2017).

2.3.2. Disciplinary perspectives

Influenced by the governance of scientific assessments is the dominant disciplinary foundation and respective (methodological) choices that shape the organization strategy (Feola, 2015). This section discusses why disciplinary perspectives are relevant to take into account when examining the potential role of bottom-up scenarios.

Firstly, it is essential to zoom in on key actors that have power to steer high-level processes based on their assumptions, perspectives and interests (either consciously or unconsciously) (Biggs et al., 2007; Driessen et al., 2012; Vervoort & Gupta, 2018). Disciplinary perspectives frame conceptualizations of the future in terms of uncertainty and manageability and ideas on how the future relates to the present, which accordingly affect the strategy. For instance, a future perceived as manageable and navigable by (societal) actors motivates a focus on transformative future visions rather than one on adaptive capacity (Vervoort & Gupta, 2018). In addition, a future approached as highly uncertain and complex could stimulate an anticipative and reflexive attitude enabling pluralistic visions on possible futures (Sondeijker, Geurts, Rotmans & Tukker, 2006; Rotmans & Loorbach, 2009; Van der Hel, 2016).

The formulated objective has implications for the choice of relevant issues, the added value of stakeholder participation and also what is considered relevant knowledge (Feola, 2015; Van der Hel, 2016). It also determines which geographical scales to consider (for instance, climate change requires a global focus whilst biodiversity needs more local contexts) (Vohland et al., 2011). In addition, the assessment of global environmental issues such as temperature rise lends itself for quantitative modelling, whereas context-dependent subjects such as land-use change can be strengthened by multiple knowledge systems. The latter would benefit from participatory methods to capture social dimensions (Opgenoorth & Faith, 2013). As such, the dominant disciplinary foundation attracts scientists with appropriate

qualities and skills. A GEA is more likely to assign global modellers if the focus is on quantifiable global issues; and social scientists if it considers social environmental issues and targets. Consequently, the disciplinary background of scientists in GEAs can have implications for the use of certain methods (e.g. IAMs or more participatory, bottom-up approaches). All these factors reflect the perceived importance of legitimacy, salience and credibility in GEAs.

2.3.3. The perceived value of legitimacy, salience and credibility

As many claim to be the UN's flagship assessment, GEAs continuously seek to attain authority in the field of environmental governance. They all have different strategies, perspectives and methods which they think are the most appropriate way to foster legitimacy, salience and/or credibility (see Appendix E for the relation between governance and disciplinary perspectives, and authority attributes). The motivation of GEAs to use bottom-up scenarios depends on the degree to which they value these attributes, which turns out to be an issue as organizations consist of different actors acting from their disciplinary perspectives and worldviews. To have an understanding of how GEAs value salience, legitimacy and credibility, the framework of Cash et al. (2003) is used as a guidance.

Salience relates to the relevance of project outcomes to end-users, which needs to be ensured in order to create impact (Alcamo, 2017; Cash et al., 2003; Van der Hel, 2016). As it depends on the kind of advice needed from the assessment, one way to measure the impact is to examine the use of project outcomes in policy making or international negotiations (Van der Hel & Biermann, 2017). The perceived appropriateness of outcomes depends on the subjective perception of targeted end-users and is therefore different for every GEA.

Credibility refers to the "perceived scientific adequacy of scientific products and arguments" (Van der Hel and Biermann, 2017, p.211) and is often the most emphasized attribute in GEAs in relation to authority (Cash et al., 2003). It requires a combination of peer review processes and a selection of appropriate qualified experts conducting the assessments. The expert nomination procedure and the criteria used for selecting credible experts or peers as well as who decides on that are therefore important factors to examine (Van der Hel & Biermann, 2017).

A process is usually perceived legitimate by stakeholders and targeted end-users if it represents different regions, disciplines and gender (Alcamo, 2017; Cash et al., 2003). The degree of diverse representation is determined in the selection process of high-level actors, authors and other stakeholders. In addition, an open process that allows transparent data generation and effective communication is more likely to be perceived as legitimate. Processes also gain legitimacy when they collaborate with other organizations - the positive feedback would not be received in a closed and isolated organization structure (Driessen et al., 2012). In addition, data sharing and co-learning improve the (scientific) quality of data and hereby foster salience and credibility of products as well (Van der Hel & Biermann, 2017).

3. Case description

This thesis comprises a comparative case study of two GEAs that acknowledge the need for more legitimate and salient assessments and are therefore attempting to experiment with the use of bottom-up scenarios: GEO-6 and IPBES. In this section, the two processes are briefly introduced.

3.1. The sixth Global Environment Outlook (GEO-6)

GEO has been established along the UN Environment's mission of 'keeping the global environment under review' (UN Environment, n.d.-a). It provides scientific information on the state of the environment, future trends and emerging issues to UN national governments and other stakeholders. The main question addressed in the GEO-6 Outlooks chapter goes one step further with "How to achieve the environmental dimension of the Sustainable Development Goals and other Multilateral Environmental Agreements (2030) and what are the long-term or mid-century strategies required for achieving long-term sustainability (2050)?" (UN Environment, 2018a, p.8). Rather than merely describing global trends, these questions imply an active role of GEO in examining what changes are needed to achieve the targets and exploring interventions to get there (UN Environment, 2018b).

GEO is an UN Environment-led process and guided by several important actor groups. The High-level Intergovernmental and Stakeholder Advisory Group (HLG) consists of governments and stakeholder representatives, and guides the development of Summary for Policy Makers that will be used by the United Nations Environment Assembly (UNEA) in international decision-making processes. The Scientific Advisory Panel (SAP) comprise a group of experts from different regions that provides scientific support and guidance to co-chairs and vice-chairs who accordingly steer the coordinating lead authors of the chapters (UN Environment, n.d.-c). The sixth GEO (GEO-6) presents itself as a "consultative, participatory process that builds capacity for conducting integrated environmental assessments and reporting" (UN Environment, n.d.-d, in Van der Hel & Biermann, 2017, p.216) and identifies scientific institutions, governments and ministries, international organizations, NGOs, indigenous peoples' networks and the private sector as important partners. Further stakeholders include research organizations, academic institutes, civil society, and scientists (UN Environment, n.d.-d).

The GEO-6 Regional Assessments (RAs) can be seen as a response to produce more relevant knowledge for sub-global policy making. The RAs have been published first in order to let them feed into the global assessment (GA), and indicate differences between interventions proposed in different regions (UN Environment, 2018b). In addition, bottom-up authors conducted an analysis using bottom-up coding to examine how the interventions discussed by the RAs differ from those related to global clusters (e.g. air, land, water, and biodiversity) included in the GA. This has resulted in additional categories, such as sharing economy, smart cities, and waste reduction – with which the authors highlight the added value of a more localized approach to complement top-down analyses (UN Environment,

2018b). Besides an analysis of RAs, the GEO-6 Outlook authors were requested by the UN Secretariat to produce more innovative outlooks for local policy makers. The authors opted for a portfolio of options, based on two bodies of knowledge; 1) a 'traditional' top-down analysis to develop global pathways; and 2) bottom-up databases such as the Seeds and CoLab (UN Environment, 2016). Similar to that of the RAs, a bottom-up analysis has been conducted of these databases. The local initiatives are grounded as they are happening at local level, and therefore serve as illustrative examples of interventions that could cause significant change. Of particular interest are synergistic, scalable characteristics that contribute to potential transformations. The analysis of Seeds and CoLab initiatives and proposals should not be considered as real scenarios but rather as a sample study. Yet still, nine new categories of interventions resulted from the bottom-up analysis, which could be included in future pathway modelling and as such shows the need for participatory approaches (UN Environment, 2018b).

3.2. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

Built on the work of the IPCC and Millennium Ecosystem Assessment (MA), IPBES has been founded under the auspices of UNEP in 2012 (Esguerra, Beck, & Lidskog, 2017). Although the IPCC is perceived as the predecessor of IPBES, their strategies are rather different (Beck et al., 2014). The former primarily considers climate change and applies a technocratic approach from the assumption that policies should be developed based on scientific information characterised by unity and high levels of certainty (Vohland et al., 2011). More specific is IPBES' focus on complex and uncertain dynamics regarding biodiversity and ecosystem-related issues. Different from a top-down method in which technocratic knowledge is applied to society, the platform participates in a science-policy dialogue to increase the relevance of its outcomes (Esguerra, Beck & Lidskog, 2017; Yates & Young, 2017). In the second Plenary of IPBES, the platform goal has been formulated as to "strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development" (Opgenoorth & Faith, 2013, p.208). This objective goes beyond describing what is broadly needed to conserve biodiversity, and rather assigns a contributing role to IPBES in translating scientific knowledge into real action through the provision of relevant knowledge to end-users.

As of May 2018, IPBES entails 130 Member States: national governments that have board in the platform. Decision-making on proposals and strategies takes place in Plenary, where Member States congregate and try to reach consensus (Beck et al., 2014). As such, IPBES can be seen as a project for and by national governments. They agreed on the Secretariat having responsibility (under vision of the Bureau, Plenary and an open stakeholder network) to undertake the platform's activities (Esguerra, Beck & Lidskog, 2017). The scientific community plays an expert role in the agenda setting process by proposing additional important topics, however, they are not involved in decision-making itself (Vohland et al., 2011). The Multidisciplinary Expert Panel (MEP) consists of five experts of each UN region that

oversee scientific and technical functions as well as select authors for assessments. Expert groups and taskforces carry out the assessments and are supported by a Technical Support Unit (TSU) that organizes meetings and provides guidance to authors. Although IPBES has originally been set up as an intergovernmental platform, it has a large stakeholder group consisting of indigenous and local communities, UN organizations and agencies, Intergovernmental Conventions (e.g. the CBD), the scientific community, NGOs and the private sector (Beck et al., 2014). IPBES forms its assessments to requests of governments, the private sector and NGOs, aiming to "identify and prioritize key scientific information needed for policymakers [...]" (Vohland et al., 2011, p.1189).

IPBES endeavors to link global with local levels resulted in the development of Regional Assessments (RAs). These RAs are meant to inform governments about their sub-region (i.e. the Americas, Europe and Central Asia, Africa, and Asia-Pacific) and propose interventions for policy making (Yates & Young, 2017). They include a systematic review of sub-global scenario studies; however, these were mostly based on global models and lacked stakeholder participation and ILK (IPBES, n.d.-d). A particularly useful participatory tool is the scoping report conducted for the Africa RA. Besides scientists, many different stakeholders addressed the main issues and priorities that the RA was requested to tackle. Those priorities did not necessarily appear from scientific evidence, but it ensured a connection between policy makers' demands and project outcomes. Another effort to experiment with participatory methods is the IPBES Nature Futures participatory workshop held in Oakland, New Zealand. The Scenarios and Models Expert group had the chance to collect multiple visions from different perspectives on how to achieve a sustainable future using the seeds of a good Anthropocene database, which resulted in seven global visions derived from bottom-up material. However, these visions form a sample rather than that they represent a broad range of local initiatives, which makes that they will not end up in the upcoming assessment round (Ferrier et al., 2016; Lundquist et al., 2017; UN Environment, 2018a). Therefore, several scholars label IPBES as yet another issue-oriented assessment (Beck et al., 2014; Vohland et al., 2011).

4. Methodology

This methodological section starts with a brief discussion on the research design, where after the two data collection methods are outlined. It concludes with a step by step explanation of how the analysis is conducted. Table 1 provides an overview of the methodological research framework of this study.

4.1. Comparative case-study design

The aim of this study is to seek explanations for difficulties that GEAs experience in using bottom-up scenarios, by comparing GEO and IPBES on the same variables: governance factors, disciplinary perspectives, and their influence on the perceived value of salience, credibility and legitimacy. Both cases are GEAs established by the UN that differ in many aspects (e.g. system scope, organization structure, and decision-making processes) of which the implications are interesting to examine. Although the analysis is case-specific, the general information can be used by other GEAs to examine the value of a more localized approach as well.

4.2. Data collection methods

In the first phase of data collection, both primary and secondary literature was conducted to become familiar with the cases. Official publications of GEO and IPBES were complemented with relevant studies found on Google Scholar, with terms used such as *global environmental assessment* in combination with *transformations; organizational strategy; participatory approach; stakeholders; and bottom-up scenarios.* When some interesting literature studies were found, more work of the same author or other often referred authors was searched for. This resulted in the scientific foundation of the theoretical and conceptual framework. Accordingly, information about influencing factors on the use of bottom-up scenarios is used to frame the content of the semi-structured interviews.

The initial plan for this research was to mainly rely on semi-structured interviews with GEO and IPBES experts. However, during the whole length of this research, the author was invited to be involved as a Fellow in the writing process of the GEO-6 Outlooks chapter. Being part of this team enabled a thorough experience of many organizational and institutional facets. Although this has led to a slight overrepresentation of GEO in terms of data collection, the insights gained from the participation were used to examine for IPBES as well.

4.2.1. Semi-structured interviews

Semi-structured interviews enable the researcher to steer the conversation whilst leaving opportunity for the interviewee to elaborate on matters they consider important. The method provides room to detect emotional and sensitive matters emphasized by interviewees that would otherwise not appear in a rigidly structured interview (Bryman, 2008). As such, an initial question (for example: ''*What do you think are the main motivations for GEO/IPBES to innovate with bottom-up scenarios?*) was posed to start the talk, after which many secondary questions were answered without specifically asking. The first respondents were asked to

describe the basic governance structure of the GEA (e.g. key actors in high-level processes, stakeholder groups and the end-users of the output). Based on this, an overall picture of the organization structure could be created. In the final interviews, more specific questions were asked to fill information gaps. At the end of the interviews for this project using this approach, it was checked by the author whether all the topics of the interview list were covered (see Appendix D for the interview template). All interviews were, with permission of the interviewee, recorded and transcribed.

The close involvement of the author with the GEO-6 Outlooks team made many of the GEO respondents easily accessible. Some of these GEO authors were also related to IPBES, which provided useful comparative insights. The rest of the participants (especially those related to IPBES) were contacted through the 'snowball method', as at the end of each interview the participants were asked to suggest other relevant people to contact. The selection criteria used for respondents were that they should be 1) contributing to either or both GEO and IPBES; and 2) in a way affiliated with the bottom-up approach. I also accounted for different backgrounds (natural and social scientists), position (coordinating lead author, lead author, Fellow, TSU) and to a lesser extent geographical background. In addition, I attempted to keep a balance between GEO and IPBES – ending up with 7 and 5 participants respectively.

4.2.2. Participant observation

Besides regular online contact, the author was invited to attend the third official face-to-face meeting with GEO-6 Outlooks coordinating lead authors, lead authors, co-chairs and the UN Secretariat. For two days (28-29 May, 2018), observations were made on the behaviour of respondents in both formal and informal settings. In addition, the author wrote parts of the chapter [23: bottom-up initiatives and participatory approaches for outlooks] and participated in group discussions and conversations, whilst notes were taken.

This unique participant observation method enabled a thorough understanding of parts of the GEO-6 process – i.e. decision-making processes, powerful key actors and rhetoric strategies used by actors to communicate their perspective. Especially informal conversations with several authors provided interesting insights in the process and culture of GEO-6. Although not all actors were explicitly informed about the dual position of the author (i.e. contributing as GEO-6 Fellow as well as using information for this research), almost everyone already knew this. The privacy of all respondents is highly respected as there is no personal information provided that can trace to their identity. Participants that were interviewed and agreed with revealing their identity have been listed down (see Appendix A) yet are anonymously referred to in the text.

Although the author was not directly involved with IPBES as such, some authors of the GEO-6 Outlooks chapter also contribute to IPBES and were able to provide detailed information on that process and culture as well. Due to mutual trust, it is expected that the personal relation between the author and the Outlook experts improved the quality and credibility of data and avoided social desirable answers.

4.3. Data analysis methods

During the data collection process, the information (from both the semi-structured interviews and participant observation) was coded according the indicators of governance factors and disciplinary perspectives (see Appendix B and C). This iterative process made it possible to identify additional important indicators to consider asking in the interviews that were still to be conducted. After labelling, the data was interpreted and written down in the respective sections. Whereas the governance factors and disciplinary perspectives could be directly asked for; data on the authority attributes was mostly based on interpretations by the researcher. To still be able to ensure consistency and credibility, beforehand links were identified between governance factors, disciplinary perspectives and the perceived importance of authority attributes by GEAs (see Appendix E). Both primary statements from the interviews and paraphrased quotes from the participant observation are used in the analysis. The personal information of respondents made it possible to take into account different contexts and interpretations of groups of actors in the analysis.

Sub-question	Concept(s)	Methods	Research object	Analysis
1. How do governance factors influence the role of different disciplinary research perspectives in global environmental assessments?	Modes of governance The role of bottom-up scenarios Authority attributes	Semi-structured interviews Participant observation	GEO: authors Global Assessment and Regional Assessments IPBES: authors Global Assessment and Regional Assessments; Expert Group 'Scenarios and Models'; TSU	Coding along governance indicators (Appendix B)
2. How do different disciplinary research perspectives value the role of bottom-up scenarios in global environmental assessments?	The role of bottom-up scenarios Authority attributes	Semi-structured interviews Participant observation	GEO: authors Global Assessment and Regional Assessments IPBES: authors Global Assessment and Regional Assessments; Expert Group 'Scenarios and Models'; TSU	Coding along indicators of disciplinary perspectives (Appendix C)
3. How do governance factors and disciplinary perspectives in global environmental assessments relate to the perceived value of legitimacy, credibility and salience?	Modes of governance The role of bottom-up scenarios Authority attributes	Semi-structured interviews Participant observation	GEO: authors Global Assessment and Regional Assessments IPBES: authors Global Assessment and Regional Assessments; Expert Group 'Scenarios and Models'; TSU	Categorizing data according the attributes *salience, credibility* or *legitimacy* in relation to governance factors and disciplinary perspectives (Cash et al., 2003 in Van der Hel & Biermann, 2017) (see Appendix E)

Table 1. Overview of the research methodology

5. Results

Findings obtained from data collected during this 8-months thesis project are structured as follows. Firstly, the mode of governance of GEO and IPBES is described and how it influences dominant disciplinary perspectives. Following, these different disciplinary perspectives are discussed on how they influence the role of bottom-up scenarios in GEAs. Furthermore, it is examined how these influencing factors shape the general perception of GEAs on salience, legitimacy and credibility – and accordingly how this affects the use of bottom-up scenarios in the process.

5.1. The influence of governance factors on disciplinary perspectives

This section elaborates on the governance structure in GEO and IPBES, and how this accordingly has shaped disciplinary research perspectives (see Appendix B for an overview of the indicators used).

5.1.1. GEO

Organization structure

Since GEO is an UN Environment-led process, there is no need to justify choices and actions to multiple stakeholders. This means GEO is relatively flexible in decision-making as long as it ensures relevance to the UNEA. It is a rather small global assessment process which does not particularly characterizes a rigid and strict organization. GEO-6 enabled social scientists to add a bottom-up chapter to the Outlooks section, however, the UN Secretariat did not agree on the fact that primary data was being used. Interviewees state that they feel GEO is quite willing and open to provide space for the bottom-up team to innovate, yet the institutions are not developed as such. Either way, GEO-6 bottom-up authors are hoping to take a step forward with their current contribution of a bottom-up methodology in the GA.

Expert nomination process

The main criteria used for selecting 'world-renowned' members for high-level positions (i.e. co-chairs, vice-chairs and coordinating lead authors) are formulated to be: their connection to academia; senior university faculty membership; and at least ten years of documented professional experience (UN Environment, n.d.-b). GEO does not emphasize diverse representation of gender and regional background as criteria for these actors (UN Environment, n.d.-b). These selection criteria do not apply for lead authors and contributing authors, however, interviewees said they were nominated via a database of qualified scientists that have contributed before, meaning they have already proven their capabilities. Since expertise gaps are strategically sought to be filled by people with specific skills, some experts have been asked to contribute to multiple GEO rounds; while young scientists have difficulties to get their position. From the participant observation it seems that although the Outlooks chapter comprises a diverse representation of authors in terms of regions (i.e. Africa, Europe, Asia-Pacific and the USA); yet almost all of them graduated in western countries,

mostly from a natural science disciplinary background. As such, limited diversity in terms of expertise at high-level positions (i.e. the SAP gives advice to the co-chairs and vice-chairs, who at their turn lead the coordinating lead authors) influences the disciplinary research perspectives in the whole process and results in an overrepresentation of natural scientists over social scientists. This complicates the implementation of the bottom-up approach, according two interviewees.

Communication and collaboration

There is a lot of miscommunication in GEO-6 between both 'worlds' (i.e. natural scientists, high-level actors that stick to the top-down approach and a small group of bottom-up advocates), which originates in the fact that the Outlooks chapter structure was already established by the time the bottom-up approach was introduced in the second stakeholder meeting in Singapore, February 2018. The limited number of face-to-face meetings with GEO Outlooks authors and high-level actors kept discussions on the value of bottom-up scenarios going. Some bottom-up authors noticed that in essence, everyone is talking about a need for similar innovations, only from different perspectives using different languages. Since learning is considered an essential aspect in gaining attention (Nadler, 1981) bottom-up authors had to choose an additional strategy to transfer their bottom-up ideas across the whole GEO-6 process by contributing to different assessments. As such, global modelers of the GEO-6 Outlooks chapter that acknowledge the relevance of the bottom-up approach acted as knowledge brokers in negotiations and discussions with the HLG, SAP and UN Environment Secretariat during authors' meetings. Furthermore, learning in terms of knowledge sharing with other GEAs is currently not happening. This originates in the fact that authors are too busy with the chapters to focus on other matters (especially given the voluntary nature of the contribution). In addition, interviewees argued that GEO is not intending to hide results – but they noticed that collaboration needs the openness of other GEAs as well.

Stakeholder participation

GEO-6 presents itself as a participatory, inclusive process (UN Environment, n.d.-d), however, it is questioned by interviewees to which groups this applies. Until now, there is a lack of strong engagement of stakeholders in the assessments. High-level decision-making characterizes limited consultation with authors, which has led to unrealistic demands regarding innovation. In terms of knowledge generation, bottom-up authors have been experimenting with a few participation tools that account for the inclusion of multiple knowledge systems, however, these are merely samples and do not end up in the GA.

Although in principle, all UN representatives have equal votes in the HLG and SAP; in reality some western countries have a stronger stand with qualified negotiators than other less represented countries. One interviewee mentioned the power of governments with a strong voice in decision-making processes whilst at the same time their low commitment to the final output. Announcements of the US State Department to the UN indicate that the USA may not use the GEO-6 report in its policy making process, whilst its strong conservative

influence in the four GEO-6 author's meetings significantly constrained innovation potential (Zhang, Dai, Lai & Wang, 2017). It turned out that especially African and Scandinavian countries are supportive towards the bottom-up approach. Whereas the former group sees opportunities to give voice to their underrepresented region, the latter wants useful policy output given their high investments in the process.

5.1.2. IPBES

Organization structure

IPBES' organization structure is described by interviewees as rigid and somewhat hierarchical. This is argued to be a limitation for innovation potential and the adoption of new approaches, since all decisions on new strategies need to attain consensus in Plenary. Similar to the IPCC, IPBES' national governments in Plenary first have to approve the Summary for Policy Makers 'line by line' before publication. The reason behind this rigor procedure, according two interviewees, are political sensitivities. Member States are afraid to reveal draft versions as certain sensitive issues may be left out after negotiation. This secrecy sounds contradictory with 'Guidance for Science and Policy point 6' of the methodological assessment report on Scenarios and Models, which states that "Human and technical capacity for scenario development and modelling may need to be enhanced, including through the promotion of open, transparent access to scenario and modelling tools, as well as to the data required for the development and testing of such scenario and modelling tools" (Ferrier et al., 2016, p.XXXI). It is argued that IPBES' secrecy leads to more flattened assessment findings, although scientists still safeguard the credibility of the reports. At the same time, this secrecy of knowledge causes exclusion of other stakeholders from the draft findings before the official launch.

Expert nomination process

IPBES Member States and important stakeholder institutions (e.g. the International Social Science Council (ISSC), Society for Conservation Biodiversity (SCB), and Future Earth) nominate experts for 80% and 20% respectively. The MEP decides on the actual selection of coordinating lead authors, lead authors and review editors for the assessments "with a view to achieve scientific excellence while maintaining a satisfactory balance of disciplines […], geography and gender (IPBES, n.d.-b, p.7) The main selection criteria in reality turn out to be mainly the latter two and are the only variables presented on the lists of experts (IPBES, n.d.-a). However, despite the good intention to achieve diversity, interviewees notice that the voluntary nature of contribution and the fact that authors are not credited for their work withhold many (especially young) people from developing countries to be involved, especially as the chance to get funding depends on the number of publications. Another group that is mentioned to be easily excluded from contribution concerns highly qualified experts from western countries. It diminishes the encouragement of experts themselves to apply to becoming a coordinating lead author or lead author, as well as restricts IPBES authors to invite specifically qualified

persons for their chapter. In addition, since the MEP assigns experts to chapters without consultation with incumbent authors, many of these authors now indicate that the goal of including ILK in the whole IPBES process was unrealistic as many experts assigned to the assessment missed specific skills and knowledge on scenarios.

Communication and collaboration

Regarding the internal process, it came out of the interviews that there is not much cross-scale representation of authors that enables knowledge sharing between the IPBES' assessments. Two interviewees mention that a possible reason for this is relates to the planning: the RAs need to be published first to feed them into the GA, whereas IPBES executes the assessments at the same time. This makes it difficult to nominate people for multiple assessments. The transmission of knowledge of participatory methods and bottom-up scenarios was the reason for at least one interviewee of the Scenarios and Models Expert Group to actively sign up for becoming review editor of another assessment. In addition, none of the interviewees were able to provide explicit examples of collaboration attempts of IPBES between other GEAs or institutes. Their closed and secret organization structure is argued to be the main constraining factor for this.

Stakeholder participation

The original rationale of IPBES was to give stakeholders equal voices and rights to increase legitimacy, however, over the years this conception has changed due to political contestation (Esguerra, Beck & Lidskog, 2017). Open involvement of stakeholders – formally called the Stakeholder Engagement Strategy (SES) - was discussed in Plenary and albeit in general many governments were in favour; the plan was not agreed upon by all Member States (e.g. China and the United States) due to worries about power allocation and decision-making processes (Beck et al., 2014). Therefore, instead of the "balanced representation of stakeholders", IPBES now "encourages all stakeholders representing, *inter alia,* their regional, disciplinary and knowledge systems in their diversity to collaborate with the Platform" (IISD, 2015, in Esguerra, Beck & Lidskog, 2017, p.69). This formulation moves away from any commitment to legal rights for stakeholders other than Member States. Stakeholders can apply through "an open registry of IPBES stakeholders for any individuals or organizations who can benefit from or contribute to the implementation of the IPBES work programme, or who can motivate others to do so" (IPBES, n.d.-e). This supposes that everyone who can identify with one or more these (rather ample) conditions can become a stakeholder – even if they only benefit from IPBES' products without the obligation to contribute to the process. As a result, a plurality of proposals from stakeholders and the corresponding wish of IPBES to meet those demands has led to frequently changing strategies and a lack of capacity. One IPBES author said that at a certain point they just wanted to finish what they had because they were not capable of doing more work. As former IPCC author and co-chair of the Land Degradation assessment Bob Scholes admits: "from the science perspective, there's a capacity issue. We are distracted by multiple priorities, we are quite fatigued" (Yates & Young, 2017).

The multi-stakeholder perspective of IPBES on the one hand recognizes different perspectives and demands from all over the world. However, since the degree of stakeholder involvement (i.e. scientists, local communities) in decision-making and knowledge generation in the process is still limited, some interviewees question the extent to which IPBES includes multiple visions in the actual process. Also, IPBES authors notice they experience exclusion from decision-making. For instance, they say that they have to follow a preordained outline (e.g. by using archetypes derived from global scenarios) within which they are asked to innovate. Also, in terms of planning they have to stick to an arbitrary timeline that does not necessarily fits scientists' needs. One author summarized it with "you get to innovative within a box". Multiple interviewees experienced little inclusive thinking in this sense and advocate a more participatory and flexible process.

5.2. How disciplinary perspectives value the role of bottom-up scenarios

Shaped by the mode of governance, GEO and IPBES developed dominant disciplinary perspectives that affect decision-making processes on, for instance, relevant methods. This section elaborates on the influence of these perspectives on the potential use of bottom-up scenarios (see Appendix C for an overview of the indicators used).

5.2.1. GEO

Dominant perspectives on relevant knowledge

GEO bases its scenario assessments on comprehensive and objective scientific publications (i.e. secondary data). This way, it tries to safeguard the level of credibility and scientific quality of its outcomes (Van der Hel & Biermann, 2017). Peer review processes conducted by independent scientists as well as UN Environment experts and the SAP ensure the assessment process is "credible, systematic and objective" (UN Environment, n.d.-c). With 'relevant expertise' as main selection criteria, GEO claims to only assign qualified 'world-renowned experts' to its assessments (UN Environment, n.d.-b). This main focus on global modelling makes that GEO-6 is still homogenous in terms of disciplinary backgrounds of experts. However, its mission to examine feasible pathways for achieving internationally-agreed environmental targets indicates a broader system scope, which requires a heterogeneous set of experts. A global modeler indicated that this mission is not likely to be answered by quantitative models only and requires a bigger role for social sciences.

Not particularly surprising is that the introduction of the bottom-up approach has caused internal issues in the GEO-6 process. During a last meeting with primarily GEO-6 Outlooks authors, it was communicated by the UN Secretariat that the message of the bottom-up section was inaccurate and did not meet the quality criteria of the SAP. Interviews with global modellers confirm the lack of clarity about how these two 'worlds' (i.e. global scenarios and bottom-up scenarios) can be combined; the bottom-up approach was still in its initial stage with some related methodological flaws. They raise there is a task for both the

bottom-up team to produce findings that fit the scientific criteria of global assessments, as well as for the leading actors to create more space for this innovative development. It should hereby be noticed that the broad focus of GEO on SDGs requires nuance in the extent to which bottom-up scenarios can provide contribute to achieving all of the goals, as some global issues are difficult to make tangible for local policy making (e.g. population growth, climate change, and temperature rise). However, given the social dimension of SDGs, a lack of bottom-up scenarios would ignore the formulated objective to contribute to achieving these goals and examine strategies for achieving long-term sustainability.

5.2.2. IPBES

Dominant perspectives on relevant knowledge

For IPBES' specific focus on biodiversity and ecosystem services-related issues it is essential to include ILK in the assessments (Tengö et al., 2017). All interviewees agree that diverse perspectives grounded at the local levels are necessary to improve connections between scales and consequently increase the impact of its reports. However, the ecological disciplinary focus has resulted in the fact that many experts and stakeholder groups have a background in natural sciences (e.g. ecologists, biologists) – which may constrain the use of participatory methods and the inclusion of multiple knowledge systems due to limited experience with this kind of tools (Lundquist et al., 2015). These disciplinary perspectives stay dominant due to a lack of collaboration with other GEAs as well as limited learning processes within IPBES itself. Only two authors were able to contribute to multiple assessments and transfer their bottom-up ideas to other people, which is not expected to have significant impact in a comprehensive GEA like IPBES. As long as Member States do not reach consensus on the value of bottom-up scenarios and fully support the implementation, the dominant disciplinary perspectives will safeguard the current top-down approach.

In addition, the implication of selecting actors on personal characteristics (i.e. gender and regional background) rather than expertise is that they often lack experience on the subject matter, while specific knowledge is required or would otherwise reduce the quality and credibility of assessments. Several interviewees confirm the issue of having many authors in the RAs with limited knowledge on scenarios, which resulted in some IPBES assessments that are treated more like a literature review rather than a systematic literature review. Also, a decrease in productivity and effectiveness during the writing process is an often-mentioned consequence. It has been raised in interviews that the exclusion of groups of experts that comes with these selection criteria potentially miss out important expertise, hereby affecting innovation potential with bottom-up scenarios. One interviewee summarized that having a diverse group of authors in terms of gender and regional background turns out not to be necessarily beneficial for the use of bottom-up scenarios.

5.3. The influence of governance factors and discliplinary perspectives on the perceived value of salience, legitimacy and credibility

Both the governance of scientific assessments and accordingly dominant disciplinary perspectives influence the extent to which they value the relevance of salience, credibility and legitimacy in their processes, on which they accordingly base their actions and strategies. This section discusses the way GEO and IPBES seem to perceive these attributes, as well as looks into the implications for the use of bottom-up scenarios.

5.3.1. Salience

GEO

From the interviews, it shows that GEO struggles with producing outcomes that impact sub-global policy making processes. Attempts have been made to experiment with RAs focused on specific regions in order to increase its salience. However, these RAs are also developed from a top-down perspective and lack multiple knowledge systems. According to multiple authors, this originates in the fact that the innovation UNEA and UN Environment asked for in the Outlooks chapter had to remain within the boundaries of the traditional assessment template. The fact that bottom-up scenarios consist still consist of primary data rather than secondary data made that authors were not able to use them in this round of assessments. At the same time, it should be noticed that the Summaries for Policy Makers based on the GEO-6 GA will be developed for the use in international negotiations by the UNEA, as it is the latter that gives mandate to the UN Environment to produce global assessments. In its actions, GEO therefore seems to mainly focus on producing relevant knowledge for this UN body, instead of really focussing on making the results useful to local policy makers. One interviewee related to IPBES said that this absence of national governments (i.e. similar to Member States in IPBES) in the GEO process results in less commitment to the report in terms of impact in regional and local policy making. At the same time, one interviewee states that measuring the impact of the GEO-5 GA turned out to be difficult since national policies usually lack clear references.

IPBES

As a new player in the science-policy interface, IPBES acknowledges the importance to foster salience to other stakeholders besides Member States. The efforts of including RAs and thematic work programmes underline this. However, the composition of some RAs (especially Americas and Europe and Central Asia) is very unspecific and broad, which undermines local contexts and consequently lowers the acceptance and appropriateness of project outcomes by local policy makers. At the same time, it has been argued that for an intergovernmental platform, it is not easy to produce products relevant to all stakeholders. One interviewee argues that in reality, IPBES mainly produces assessments relevant for its Member States, which they consider the target group. At the same time, this interviewee notices the fact that Member States having control over the process suggests a high level of commitment to the report, which can be used to address countries on their policy making (IPBES, n.d.-b). Although

the importance of connecting with local policy makers has been recognized with work programmes focussing on Policy Support and Communication and Stakeholder Engagement, these programmes primarily focus on supporting the target audience and do not actually lead to the inclusion of multiple knowledge systems in the GA and RAs.

Since the RAs have been launched in March 2018, in Medellin, Columbia; the actual impact is yet to be explored. Although some action plans and strategies based on the published pollination assessment have actually been used in various countries (e.g. France, the Netherlands, Brazil, South Africa and the Republic of Korea); IPBES' Chair Robert Watson notices that the published reports only confine to the Foreign Office and Environmental Departments (Yates & Young, 2017). The fact that the report stays in the margins is also raised by an interviewee, who states that it is frustrating when external experts on a specific topic are not aware of work produced by IPBES. Yet the fact that IPBES aims to include multiple stakeholders and ILKs enhances the chance for bottom-up scenarios to be used.

5.3.2. Legitimacy

GEO

In general, the mission of GEO-6 to support the achievement of the SDGs and other agreements with a multi-level approach is considered a positive sign for the future application of bottom-up scenarios, as it requires a connection with local policy makers rather than merely large stakeholders (e.g. UNEA and national governments). The fact that the GEO-6 Outlooks section contains a separate chapter on the bottom-up approach proves the increased acknowledgement of high-level actors to make the assessments more legitimate. Bottom-up authors aimed to include an analysis of seeds and Climate CoLab-initiatives, however, actual results on the content do not end up in the GEO-6 Outlooks chapter as the findings did not meet scientific standards. Nevertheless, bottom-up authors managed to include a bottom-up methodology in the GA as well as showcased nine additional categories of interventions that have not been covered by global models (UN Environment, 2018b). Still, the lack of diverse knowledge systems in the current round of assessments is expected to decrease the acceptance of the report by regional and local policy makers – hereby affecting its legitimacy.

IPBES

Legitimacy to Member States and a large stakeholder group is perceived as an important attribute by the IPBES process. With its multi-stakeholder approach, IPBES tries to foster and safeguard its legitimacy by accepting diverse proposals. At the same time, interviewees stated that too many calls resulted in a lack of capacity rather than the representation of multiple knowledge systems – as local stakeholders are still excluded from the assessment process itself. This while capacity is one of the prerequisites for using participatory tools to collect bottom-up material. Another consequence of this strong accountability is the secrecy with which IPBES treats findings and data to other stakeholders. One interviewee said that this structure allows mainly governments to oversee the authenticy of the process. This secrecy

poses implications for IPBES, since especially at lower scales it is essential to make draft versions publicly accessible to receive important insights and foster legitimacy (Vohland et al., 2011).

Efforts to increase legitimacy include the attempt to incorporate ILKs into the pollination assessment, which however resulted in a dominant representation of ILK-experts, rather than direct engagement of ILK-holders in negotiation and application tasks (IPBES, n.d.-c; Tengö et al., 2017). Another effort - a participatory Nature Futures workshop organized and funded by the New Zealand government, enabled the Expert Group on Scenarios and Models to experiment with the inclusion of local initiatives from the Seeds of Good Anthropocenes database. The coordinating lead author argued that: "You cannot include indigenous [knowledge] by starting at the global; you have to go bottom-up". Since nothing has been published before yet, it should be seen as an initial effort in a 5-years' process. It considers a relatively small sample of local initiatives and does not reflect representative outcomes at this point (Lundquist et al., 2017). Still it is expected to increase sense-making to people and can be seen as an optimistic initial step towards the use of bottom-up scenarios. In addition, testing the approach enhances the chance of getting endorsement in Plenary to do this more often. (Sceptical) governments are expected to recognize the relevance of the bottom-up approach if more results are published.

5.3.3. Credibility

GEO

The fact that GEO uses selection criteria for high-level positions mainly based on expertise and skills shows the perceived importance of credible knowledge production. One interviewee states that besides GEO's credibility, this strategy also fosters the productivity and effectiveness of the work. Since GEO only includes scientific, secondary data in its assessments, it turns out difficult for the bottom-up team to showcase the approach. They say the main issue is the lack of existing secondary bottom-up material, which means they have to develop it themselves through workshops and accordingly publish the primary data. For this round of assessments, it means that the high importance of credibility turns out the main reason bottom-up scenarios are not included yet.

IPBES

IPBES has been established as 'an IPCC for biodiversity' – which is recognized as the UN flagship in producing the most comprehensive orchestration of scientific information on climate change (Beck et al., 2014). It conducts thorough review processes by experts, governments, stakeholders and finally Plenary. At the same time, the expert selection criteria of diverse representation used by the MEP reveals that credibility is not the all-encompassing focus of IPBES. In addition, IPBES shows its willingness for multi-stakeholder inclusion and goes beyond scientific peer-reviewed knowledge by establishing different thematic assessments (e.g. on Pollinators, pollination and food production; and Land Degradation and restoration)

and Expert Groups such as Scenarios and Models having the opportunity to experiment with innovative methods (e.g. the Nature Futures workshop). However, these promising innovation spaces remain excluded from the actual assessments. In the end, IPBES keeps using the scientific assessment template with primarily scientific knowledge for the development of its assessments.

5.4. Comparing cases

In this section the findings of GEO and IPBES are compared in order to reveal any 'best-practices'. First, the similarities between the two are discussed, followed by the differences. Later in the discussion, recommendations are proposed on how several governance factors and disciplinary perspectives can enable the bottom-up approach to be implemented.

5.4.1. Similarities

Role science-policy interface

Whereas originally, GEAs functioned as scientific bodies providing quantitative, objective and descriptive information about the environmental state and trends – now with an increasing demand for information useful to achieve international agreements, they are arrogating an important role in the field of global environmental governance (Ramirez & Selin, 2013). The response on the demand to produce policy-relevant information makes them go beyond their original role of expert-driven and neutral knowledge provider, since they now aim to provide solution-oriented knowledge (Van der Hel & Biermann, 2017; Vervoort & Gupta, 2018). Also GEO and IPBES are confronted with the question of what exactly is appropriate knowledge and which groups should be involved to be able to produce it, especially given the limited connection of previous project output to local policies. The increased role of politics and governance in scientific assessments requires a shifting emphasis on salience, credibility and legitimacy. Both GEO and IPBES seem to slowly move away from traditional assessments that focus on credibility only and developed their own ways of experimentation.

Capacity

The GEO-6 second order draft showed that bottom-up authors had high ambitions to implement the bottom-up approach in the GA. Later in time, it became clear they were not able to actually integrate this approach yet, which made them to adjust their promises in the Outlooks chapter accordingly. This resulted, amongst others, from considerable capacity issues in terms of financial resources, manpower but especially a tight time schedule. The lack of existing secondary material forced them to start from scratch and publish primary data to make the information scientifically sound. IPBES struggles with a lack of resources as well. Although their focus on biodiversity and ecosystem services-related SDGs would imply a specific disciplinary focus - instead IPBES' multi-stakeholder position and consequently the aim to meet multiple demands has caused a distraction of priorities, with all its consequences for the room to experiment with novel approaches.

Powerful actors

Power allocation seems to be an important influencing governance factor on the use of bottom-up scenarios in GEO and IPBES. In both cases, the bottom-up team acts from a niche-position and tries to gain support of powerful actors in order to further develop. In IPBES it regards the Member States that have the main say – whereas GEO has the UN Environment Secretariat, chairs, and SAP that steer the process. It turns out to be difficult to enable learning and communicate bottom-up ideas due to a lack of diversity at higher levels. Both in GEO and IPBES, mainly natural scientists position high-level functions, which in addition are for GEO primarily qualified western experts. A lack of diverse perspectives can hereby be a potential diminishing factor for learning potential and the acknowledgement of personal biases.

Communication

In both GEO and IPBES, the lack of regular face-to-face communication has led to issues of misunderstanding between two 'worlds'. The early development of the GEO-6 Outlooks chapter without the involvement of bottom-up authors has resulted in different ideas on how to integrate bottom-up scenarios. In IPBES, decisions made in Plenary by politicians and policy makers lacked the involvement of coordinating lead authors and lead authors – with all its consequences for the effectiveness and productiveness of the work. In order to convince the regime of high-level actors, it requires thinking about a clear strategy by the bottom-up team. Besides looking for methodological rapprochement, it is relevant to indulge and spend time on finding an accepted way to combine local data with global scenarios, as argued by two global modelers. Particularly important is to identify common ground in two different disciplinary worlds and languages used. The role of some legitimate knowledge brokers (preferably global modellers) transferring ideas to high-level groups is hereby indispensable.

5.4.2. Differences

Organizational structure

GEO and IPBES highly differ in their organizational structures. The comprehensive IPBES process is strictly organized by Member States that make decisions in Plenary through a consensus-oriented approach. The consequent slow and rigid organization structure is argued by one interviewee to be a reason for the absence of responsive change towards the bottom-up approach. It frustrated one former coordinating lead author of IPBES that he was not provided with feedback on the work he had done, nor an update was given on the continuation of 'his' assessment. From the third GEO-6 Outlooks authors meeting, it showed that GEO is smaller and less centrally organized – the UN Secretariat directly communicated with coordinating lead authors, lead authors and Fellows. Although the actual way of communicating is not very efficient, at least it shows some more involvement and less hierarchical structures than in IPBES. The more flexible approach of GEO-6 reflects in the opportunity for bottom-up authors to include their section directly in the GA.

The fact that, moved by political interests, IPBES' Member States control findings and keep them highly secret has reduced the openness and transparency of the process. The mission of IPBES to co-produce knowledge through working with a diverse set of stakeholders seems incongruent with holding back information and the closed access to data. GEO's work is less driven by political interests and therefore more suitable for data sharing. Within the process, there is a higher overlap of authors working on different chapters in GEO than in IPBES. GEO finished the RAs first and then started the GA, whereas in IPBES they are developed at the same time.

Expert nomination process

There are several arguments to substantiate IPBES is doing well by selecting diverse experts to conduct the assessments. Diverse perspectives of authors enable learning processes and ensure legitimacy to different stakeholders. Whilst diverse representation of authors is mainly understood in terms of gender and region; it can also be perceived in terms of expertise. In GEO, experts get nominated mainly based on their qualities and accordingly asked to contribute to a chapter. Qualified experts that represent their subject matter and secure credibility are argued indispensable in GEAs. One IPBES author stated that many selected experts do not represent the chapter if their skills mismatch the content. In addition, authors without a clear understanding of scenarios are not expected to innovate with including bottom-up scenarios in assessments as a certain level of expertise is needed for this. However, although GEO authors are highly qualified and skilled in the topic they got assigned to, the chance of real innovation is still low due to a lack of diverse perspectives and an overrepresentation of highly qualified global modelers (mostly older males) from development countries. Based on the participation observation and interviews it can be argued that with their power, they easily shape perceptions in favour of the top-down approach.

Spaces for innovation

Although both processes are to some extent experimenting with bottom-up scenarios; they have established their own ideas on how to develop spaces for innovation. Isolated from the assessments, IPBES enables Expert Groups such as Scenarios and Models to work on methods and support guidance to assessments. They can be seen as innovation hubs that enable experimentation with novel approaches. The most successful example is the participatory Nature Futures workshop that used seeds initiatives. In the GEO-6 process, there is no such clear innovation space for the bottom-up team. Attempts to use bottom-up scenarios had to be directly included in the global report. However, the limited bottom-up material that existed at that time did not meet the scientific standards of the GA. They experimented with assessing bottom-up initiatives from existing databases (seeds of good Anthropocene and Climate CoLab), but were not able to produce representative results that could be combined in the GA.

6. Conclusion

The need for radical transformations towards a more sustainable future has caused an increasing demand by societal actors for more locally relevant and representative knowledge produced by GEAs. Global pathways developed with top-down tools in previous assessment rounds may have been discussed in intergovernmental negotiations, however, the information is barely integrated in (local) policy making. This shows the need for tools that better fit local levels: bottom-up scenarios. Although many GEAs acknowledge the need for including more diverse knowledge systems – yet the implementation process of combining bottom-up scenarios with global scenarios turns out to be full of constrains. This research responds with the aim to examine the influencing factors on the use of bottom-up scenarios in GEAs. Governance factors (i.e. the organization structure) and factors related to the dominant disciplinary perspectives enable a closer look into the implications of certain strategies of GEAs. Together with the consequent value attached to producing relevant output to end-users (salience), being representative for multiple stakeholders (legitimacy) and producing scientifically sounds knowledge (credibility), something can be said about what GEAs should consider changing in order for bottom-up scenarios to be used in the next round of assessments. The following research question was developed:

How do governance factors and disciplinary perspectives of global environmental assessments influence the role of bottom-up scenarios?

First, indicators related to governance factors and disciplinary perspectives of GEAs were derived from relevant literature, which resulted in two groups of independent variables that were accordingly examined for two GEAs that are currently experimenting with bottom-up scenarios: GEO and IPBES. Semi-structured interviews with authors of both GEO and IPBES were conducted, as well as a participatory observation for the GEO case. In the analysis, the influencing factors were discussed and indicated the perceived importance of authority attributes (salience, credibility and legitimacy) in both GEAs, and how this affects the role of bottom-up scenarios accordingly.

From the analysis, it turns out that governance factors highly influence dominant disciplinary perspectives. Whereas most scientists in GEAs are convinced; it is mainly the UN Secretariat, SAP and Chairs in GEO, and Member States in IPBES that still advocate the dominant top-down approach of global models. They are the ones that decide on institutional features (e.g. stakeholder participation, and expert nomination) and consequently shape the content (e.g. choices on the inclusion of different knowledge systems). The GEAs both seek to be more representative to stakeholders and assigned social scientists to account for the inclusion of social dimensions. A bottom-up team that operates in the margins of GEO and IPBES has been trying to implement the approach in both processes, yet lacked sufficient support of high-level actors due to different understandings of its application. Until yet, it seems there is a lack of understanding and effective communication between, as they name it, both 'top-down and bottom-up worlds'.

The underlying constrain in using bottom-up scenarios turns out to be the traditional dominant focus of GEAs on producing scientific knowledge, related to the perceived value of credibility over legitimacy and salience. The use of secondary data is basically the only appropriate way to include local knowledge systems given the current assessment template and culture. Publishing primary data into secondary data requires a large amount of financial resources, manpower and time.

For bottom-up scenarios to be used, high-level groups need to become aware of the growing importance of values beyond credibility, and recognize salience and legitimacy as equally important and necessary for GEAs to translate scientific knowledge in action. Unless these high-level actors fully acknowledge the added value bottom-up scenarios, it is unlikely they will act upon that conviction and provide necessary support. Yet if they do, it would increase the chance that bottom-up scenarios will be used in the next assessment rounds and hereby make global scenarios more realistic, diverse and grounded. Only then, it can be expected from local decision-makers and policy-makers to take specific actions that contribute to sustainable development. Societal groups are then able to strategically act and support this broad tendency. As such, promising steps can be taken towards transformations to a more sustainable, Anthropogenic future.

7. Discussion

7.1. Recommendations

There are various aspects for both high-level actors as well as the bottom-up team of GEO and IPBES to consider adjusting in order to create enabling conditions for the use of bottom-up scenarios. Several recommendations relevant to either or both GEO and IPBES are presented in Box 1.

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Recommendation 1: Improve research capacity
Applies to: GEO and IPBES

To mainstream the bottom-up approach, GEAs need to invest time, manpower and financial resources (Tengö et al., 2017). Budget requirements as well as expectations about the project outcomes should be included in planning and coordination processes. Instead of making promises to stakeholders based on ambitious aims beforehand, rather uncertainty should be communicated in calls. Clarity and transparency are hereby essential. In terms of expectations, funders and other stakeholders should respect this and preferably provide sufficient time and resources (Görg et al., 2014; Mahmoud et al., 2009). This should also be integrated in project effectiveness criteria to avoid negative evaluations.

IPBES in particular should stick to its priorities by either or both adopting a more flexible attitude in rejecting diverted calls, and asking stakeholders for a share of the experts' time or financial resources needed to deliver reports. The position of IPBES having many stakeholders with different interests requires clear ideas and institutions to decide on what is relevant for its scope, while financial and technical support would reduce the overload and continues the provision of output.

GEO and IPBES currently ask a substantive 20% of experts' time and need to find ways to attract more people in order to reduce it. If less time is requested from authors, contributing would be more suitable for people from developing countries as well as junior researchers; groups that usually lack sufficient funding. The reduced pressure on GEAs would create more opportunities for experimenting with the bottom-up approach, such as the publication of secondary data, but also opens up opportunities to reach out to other GEAs and share thoughts and knowledge.

Recommendation 2: Enhance transparency, openness and flexibility
Applies to: IPBES

IPBES may consider the value of a more transparent and open process, since knowledge and data sharing between GEAs proves to enhance legitimacy to stakeholders. It could also increase capacity since joining forces enhances resource efficiency. For the bottom-up approach it is beneficial as co-learning processes can speed up the implementation process. Learning within - as well as between processes can be facilitated by knowledge brokers that translate knowledge to enable mutual understanding between actors (Tengö et al., 2017).

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As Sondeijker et al. (2006, p.20) stated, it is all about: "stretching and focussing – […] a balance between on the one hand representing a window of opportunity and on the other hand functional clarity and simplicity". Instead of a rigid organization, in this sense it might be valuable to consider a more anticipative management strategy that answers to changing circumstances in society. Related to this, is recommended to IPBES to leave some extent of flexibility in the definition of outcomes beforehand. Its current way of consensus-based decision-making can be characterized by certainty and raising expectations rather than flexibility and innovation (Yates & Young, 2017). As Member States in Plenary act upon their (political) interests, it can be expected that specifically politically sensitive findings get flattened in assessments. Undermining scientific information can influence the extent to which stakeholders perceive the process as scientifically credible. Although the governance structure is difficult (if not impossible) to change; IPBES can choose to receive more input from stakeholders through the provision of open access to data. This would increase legitimacy, as it enables them to bring in new and relevant information, which for IPBES could be considered as useful feedback and a way to increase the relevance of its output.

Recommendation 3: Ensure a balance of quality and diverse representation in selection criteria
Applies to: GEO and IPBES

It would be good if IPBES puts more weight on selecting experts based on expertise, whilst at the same time keep on looking after diverse representation as much as possible. For GEO, it is the other way around – they should safeguard more diversity in the process. A way to ensure diverse representation without diminishing the quality of work is to involve diverse stakeholders in scoping reports like IPBES did for the Africa RA. This way, the relevance of the report is ensured as key priorities are brought in by diverse local people that need to address these issues in their day to day life. Qualified authors can build on that and produce credible, scientific results. It should therefore not be a problem when there is a slight overrepresentation of certain groups of people working at IPBES or GEO, as long as they work with diverse ILK-holders in the scoping report as well as the knowledge production process.

Recommendation 4: Consider collaboration
Applies to: GEO and IPBES

In the past, policy making has not been really systematic, nor did it focus on transformative change. Strong signals of governments such as the Dutch Ministry of Infrastructure and Water Management, particularly emphasize the need for more coherent and holistic findings. Improved coordination between GEAs could enhance clarity for policy makers if they together produce comprehensive Summaries for Policy Makers rather than multiple ones with basically the same message. Collaboration would also enhance the internal process. Authors working on both GEO and IPBES assessments mention that they had to do the same work twice as both processes produce, for instance, reports on land degradation and target seeking scenarios for biodiversity. In particular, the Dutch government requested GEO to provide more information on natural resource management, which fits the IPBES focus. It would make little sense if GEO produces this from scratch as building reports requires a lot of efforts and resources. Collaboration would therefore account for the lack

of scientists in both processes, as well as financial resources and time constrains (Kok et al., 2017). As sharing forces would ease the workload, it is expected to open up opportunities for innovation and experimentation around bottom-up scenarios. In addition, GEO and IPBES themselves would benefit in terms of authority. Research has shown that (non-profit) organizations that share their information and knowledge become more legitimate to stakeholders as they get positive feedback in return. As such, sharing knowledge could be seen as a strategy providing benefits instead of efficiency loss (Levitt & March in Godwyn & Gittell, 2011).

A first step towards collaboration whilst respecting the confidence of matters would be, for example, collaboratively organizing a participatory workshop on envisioning futures. Both GEO and IPBES should then look after the planning and coordination as the frequency of meetings could be increased due to more capacity. This first effort does not harm the secrecy of findings as it applies to parts of the data collection process only. Such an initial stage of collaboration enhances mutual trust and may lead to a next step of actual data sharing or sharing strategies. For instance, innovation hubs like the Expert Groups of IPBES would enable GEO authors to work on publications and create a solid scientific base on which the next round of assessments can build. IPBES, on its turn, should provide support for more innovation in its GA. It would make sense to experts of the Scenarios and Models Expert Group if their findings regarding the bottom-up approach would be used more prominently instead of merely isolated from the actual GA. In this sense, IPBES can learn from the way GEO has included a bottom-up chapter in its Outlooks section.

Recommendation 5: Collaboration between the GEO and IPBES bottom-up community, and other bottom-up communities
Applies to: GEO and IPBES

Besides recommendations to key actors of GEAs – it may be just as important for the bottom-up team to reflect on its own position. It has been noticed by two interviewees that they can be slightly normative in their ideas. For instance, the assumption that technology is limited in the solutions it can provide towards sustainable futures; and that in general people at local level want to contribute to a better future. When strongly propagated, this attitude can induce resistance in discussions. Besides the bottom-up team related to the seeds-initiative, interviewees raised that there are more bottom-up communities (e.g. on sociotechnical transitions, and lifestyle projects) working on enabling transitions based on what is happening at local levels. Sharing experiences with these groups could enable learning and provides insight on their own position as to keep a constructive attitude in negotiations and debates. Well-developed communication skills of the bottom-up team as well as some understanding on the interests of high-level actors will therefore strengthen the ability to transfer the bottom-up concept successfully.

Box 1. Recommendations to GEO and IPBES

7.2. Limitations

This thesis project recognizes several limitations that need to be noticed. Firstly, the fact that research on the role of GEAs in the academic field of environmental governance is fairly new, made that there was limited theoretical foundation on which to base relevant indicators as well as the analytical framework. Therefore, some extent of inventiveness had to be complemented to existing frameworks in order to account for the needed information. To limit the chance that important indicators were missed, additional relevant aspects that appeared during the interviews and participatory observation were added to the list of indicators, which has therefore been revised several times. Additionally, in order to analyse the influence of governance factors and disciplinary perspectives on the perceived value of authority attributes (i.e. salience, legitimacy, and credibility), a link had to be established between these variables. The lack of literature on this made that the researcher provisionally created these links based on common sense and related studies. They are therefore not comprehensive, nor complete and may need revision.

Another limitation is that this study is slightly biased as most interviewees positioned a role of coordinating lead author or lead author, whilst there is an underrepresentation of high-level groups such as Member States, the SAP, HLG, and the UN Environment Secretariat. Although some have been contacted by the author, a lack of response constrained their representation in the analysis. However, the role of the author as a GEO-6 Fellow during this thesis project enabled that insights obtained from observations and discussions between some high-level actors (i.e. UN Secretariat, co-chairs, several coordinating lead authors and government representatives) during authors' meetings could be included in the report. Whereas a similar high level of engagement of the author in the IPBES process was not possible, the same information has been asked for in the interviews.

Finally, it should be noticed that this research is conducted in a parallel timeframe to the development of assessments by GEO and IPBES. This constrained a thorough analysis on the actual impact of this round of assessments, as some have not been published yet. However, again the internal position of the researcher in the GEO-6 process enabled confidential insights in current draft assessments of both GEO-6 and IPBES.

7.3. Future research

Now the influencing factors on the role of bottom-up scenarios are clear, more research is needed on how to exactly stimulate this process of change in large organizations like GEAs.

According to Mintzberg and Westley (1992), real change proceeds through 1) a learning process; 2) shifting the mind set to a new vision; and 3) implementing in it in practice (Mintzberg & Westley, 1992) (see Figure 2).
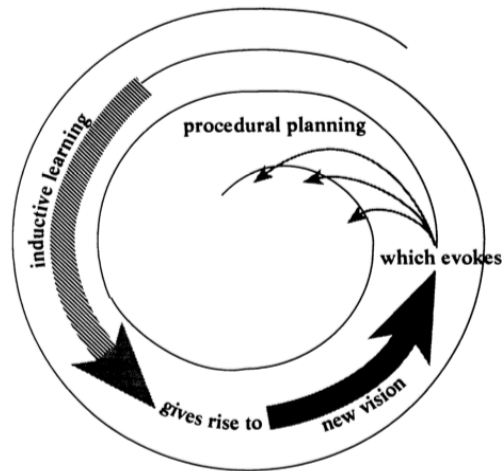
Figure 2. Process of change. Source: Mintzberg and Westley (1992).

The process of inductive learning is important since firstly, multiple actors need to acknowledge the relevance of change through a process of sense-making. Language and communication skills are hereby essential (Nadler, 1981; Seidel, Chandra Kuse, Székely, Gau & Stieger, 2017). Learning processes in GEAs require room for scientists to manoeuvre and experiment, as valuable ideas appear in opening up appreciations of choice (Beck et al., 2014). Both GEO and IPBES are moving in this first phase, as the bottom-up approach started as a rather informal experimentation by small groups operating in the margins of GEAs, which are now seeking to gain relevance at high-level actors (Mintzberg & Westley, 1992). In both GEAs, bottom-up authors struggle with vested dominant disciplinary perspectives, related differences in language and consequently communication issues. According to the GEO-6 bottom-up chapter (UN Environment, 2018b, p.5), "to capitalise on the opportunity for complementary benefit, it is recommended that future GEO efforts include more explicit, structured interaction between top-down scenario developers (specifically the IAM community and subject matter experts) and bottom-up stakeholders". One bottom-up author admitted the difficulty of working with the approach when they started to realize some flaws in the methodology and a missing link with the global chapter. The fact that the work is fairly new means there is no massive invent space to support the ideas. Whereas initially they wanted to hide these uncertainties to avoid rejection; instead they continued working on ways to strengthen the methodology and discussed these ideas with other actors such as global modellers, which is important for improving the approach.

In the next phase, it is essential to develop one common vision into the preferred direction (Mintzberg & Westley, 1992). In learning processes, actors of GEO and IPBES constructed their own idea and interpretation about the new situation. A clear design of this direction helps individuals to understand the idea behind the change and find a common ground. Often, it turns out that divergent thoughts actually congregate into this common vision, and that differences in opinion turn out to be more a matter of different languages (Seidel et al., 2017). In the last phase, it is important to implement multiple and consistent leverage points of change. Instead of focussing on only one or a few components, efforts

should focus on structural change (Seidel et al., 2017). To somehow keep the balance in a disrupted stable state, Rotmans and Loorbach (2009) and Seidel et al. (2017) promote incremental change when seeking for long-lasting radical change, in order for the system to adjust to the new situation.

Although the recommendations in this thesis provide initial practical options to change, further research can build on this line of thought by exploring how bottom-up advocates together with high-level actors can be supported in completing these phases of change, in order for bottom-up scenarios to be used in the next round of GEO and IPBES assessments.

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Appendices

Appendix A – List of interviewees

Name, title	Position	Communication
Dr. Joost Vervoort	- GEO: Lead author Outlooks chapter (bottom-up section) - Seeds of Good Anthropocenes	Interviewed and informal contact
Dr. Laura Pereira	- GEO: Coordinating lead author Outlooks chapter (bottom-up section) - IPBES: LA Africa RA - Seeds of good Anthropocenes	Interviewed on Monday 26th February – Utrecht University Campus / Informal contact
Dr. Jeanne Nel	- GEO: Lead author Outlooks chapter (bottom-up section) - IPBES: Fellow	Interviewed on Monday 26th February – Utrecht University Campus / Informal contact
Dr. Nadia Sitas,	- GEO: Lead author Outlooks chapter - IPBES: Fellow for Africa RA	Interviewed on Tuesday 27th February – via Skype
Dr. Detlef van Vuuren	- GEO: Coordinating lead author Outlooks chapter (global pathways)	Interviewed on Wednesday 28th February – Utrecht University Campus
Dr. Rob Alkemade	- IPBES: Head of TSU – Expert Group Scenarios and Models	Interviewed on Monday 9th April - PBL
Dr. Garry Peterson	- IPBES: Coordinating lead author Expert Group Scenarios and Models Expert Group (first report); review editor	Interviewed on Wednesday 24th January - Utrecht University Campus
Dr. Paul Lucas	- GEO: Coordinating lead author Outlooks chapter (global pathways)	Interviewed on Monday 9th April - PBL
MSc. Rohan Bhargava	- GEO: Fellow Outlooks chapter (bottom-up section)	Informal contact

Appendix B – Influencing factors: governance-related

Indicator	Specific interview question	Literature support
Purpose/aim of the assessments	What is the primary aim of the assessments in terms of envisioned impact?	Biggs et al. (2007); Driessen et al., (2012); Vervoort & Gupta (2018)
Key actors	Who are the key actors leading the GEA?	Alcamo (2017); Biggs et al. (2007); Vervoort & Gupta (2018); Driessen et al. (2012)
Peer review process	Who is allowed and able to take part in peer review processes? Whose perspective and expertise are included?	Van der Hel & Biermann (2017)
Expert nomination process	Who decides on the expert nomination process? Based on which rationales are certain (groups of) authors selected?	Van der Hel & Biermann (2017); Driessen et al. (2012); Vohland et al. (2011)
Transparency	Are knowledge production processes open and transparent? Who decides on that?	Van der Hel & Biermann (2017); Opgenoorth & Faith (2013); Driessen et al. (2012)
Stakeholder participation	Does the defined community and stakeholders feel part of the initiative? What procedures and mechanisms exist to support stakeholder participation and representation in the process?	Van der Hel & Biermann (2017); Driessen et al. (2012); Kok et al. (2017); Görg et al. (2014); Feola (2015); Vohland et al. (2011); Vervoort & Gupta (2018); Biggs et al. (2007); Driessen et al. (2012)
Collaboration	Does the GEA support knowledge sharing and/or other forms of collaboration between GEAs?	Driessen et al. (2012)

Appendix C – Influencing factors: disciplinary perspectives

Indicator	Interview question	Literature support
Purpose/aim of the assessments	What is the primary aim of the assessments in terms of envisioned impact? From which disciplinary perspective?	Vervoort & Gupta (2018); Driessen et al. (2012); Biggs et al. (2007)
Project output	What kind of (relevant) advice is needed from science? For whom?	Van der Hel and Biermann (2017)
Integration knowledge systems	Which knowledge is integrated in the assessments?	Biggs et al. (2007); Kok et al. (2017); Driessen et al. (2012); Van der Hel & Biermann (2017); Opgenoorth & Faith (2013)
System scope	Which scales are considered in the assessment?	Opgenoorth & Faith (2013)
Disciplinary background experts	What is the division of natural scientists and social scientists in the GEA?	Van der Hel & Biermann (2017); Driessen et al. (2012); Vohland (2011)
Definition credible knowledge	How does the GEA define 'credible knowledge'?	Driessen et al. (2012)

Appendix D – Semi-structured interview template (initial version)

Welcome *name participant,*

Firstly, I would like to thank you for taking the time for this interview.

- Time scheduled: 1 hr.

The aim of this research is to investigate two global environmental assessment processes that are currently innovating with bottom-up scenarios: GEO and IPBES. I will go into more detail to see how both processes are internally governed (this relates to the organization) and what their disciplinary approach is (which is more the content of the process). Since you are working for GEO/IPBES, I would like to ask some questions. Based on the results about the differences and similarities between the two - I will examine on which aspects they potentially can work together to save efforts. Finally, recommendations will be given on how bottom-up scenarios are more likely to be used. Do you have any questions so far?

- Ask permission for recording -

1. *Can you tell something about your role at GEO/IPBES?*
    o   *.. how are you involved in the process? Position?*

2. *How is GEO/IPBES organized in terms of:*
    o   *.. who initiates the process?*
    o   *.. who sets the agenda?*
    o   *.. who decides on the nomination of experts doing the assessments?*
    o   *.. who frames the issues?*

3. To what extent do you think this governance structure influences the independent and objective assessment body that GEO/IPBES says to be?

4. Who are the main end-users of the assessment?

5. What does this governance structure mean for the relevance of different end-users (such as local communities)?

I would like to dive a little deeper into what extent GEO/IPBES works with bottom-up futures.

6. How would you describe bottom-up scenarios?

7. How is Indigenous and Local Knowledge (ILK) incorporated in the development of bottom-up futures?

8. Why does GEO/IPBES experiment with bottom-up scenarios?

9. Are bottom-up scenarios going to be used in the global assessment?

10. Do you think the use of bottom-up scenarios influences the relevance of the assessment for different end-users?

11. Are there any constraints in the use of bottom-up scenarios?

--------- (Only for people involved in both processes) --------

The last question is about potential collaboration between the IPBES and GEO.

12. Can you think of a potential contribution of GEO-6 in the IPBES process?
   o   .. and vice versa?
   o   .. based on this, would there be a potential for collaboration?

13. Do you think that would influence or improve the relevance of the assessments for different end-users?

One last practical note: I would like to speak with a diverse set of people working at GEO and IPBES to cover multiple perspectives on the process.

14. Do you know any more people you recommend me to talk to?

Thank you so much for your time!

Appendix E – Link between governance factors, disciplinary perspectives and authority attributes

AUTHORITY ATTRIBUTE	INDEPENDENT VARIABLE	G = GOVERNANCE D = DISCIPLINARY PERSPECTIVES	SOURCE(S)
SALIENCE	Purpose/aim of the assessments	G / D	Vervoort & Gupta (2018); Driessen et al. (2012); Biggs et al. (2007)
	Relevant output for target group	D	Van der Hel & Biermann (2017)
	Integration knowledge systems	G / D	Biggs et al. (2007); Kok et al. (2017); Driessen et al. (2012); Van der Hel & Biermann (2017); Opgenoorth & Faith (2013)
	System scope (e.g. number of scales)	D	Opgenoorth & Faith (2013)
CREDIBILITY	Definition 'credible knowledge'	D	Driessen et al. (2012)
	Peer review process	G	Van der Hel & Biermann (2017)
	Expert nomination process	G	Van der Hel & Biermann (2017); Driessen et al. (2012); Vohland (2011)
	Transparency	G	Van der Hel & Biermann (2017); Opgenoorth & Faith (2013); Driessen et al. (2012)
LEGITIMACY	Key actors	G	Alcamo (2017); Biggs et al. (2007); Vervoort & Gupta (2018); Driessen et al. (2012)
	Expert nomination process	G	Van der Hel & Biermann (2017); Driessen et al. (2012); Vohland (2011)
	Disciplinary background experts	D	Van der Hel & Biermann (2017); Driessen et al. (2012); Vohland (2011)
	Transparency	G	Van der Hel & Biermann (2017); Opgenoorth & Faith (2013); Driessen et al. (2012)
	Stakeholder participation	G	Van der Hel & Biermann (2017); Driessen et al. (2012); Kok et al. (2017); Görg et al. (2014); Feola (2015); Vohland et al. (2011);

			Vervoort & Gupta (2018); Biggs et al. (2007); Driessen et al. (2012)
	Collaboration	G	Driessen et al. (2012)