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The Future of Global Environmental Assessment Making (FOGEAM): Reflecting on past experiences to inform future choices

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Contents

Introduction

Since the publication of the Organization for Economic Co-operation and Development (OECD) Assessment on Long-Range Transport of Air Pollutants (LRTAP) in 1977, approximately 100 global environmental assessments (GEAs) have been completed. GEAs can be understood as social processes where multiple experts and stakeholders assemble, discuss, and synthesize existing scientific knowledge on complex environmental issues with a view towards informing public policy discourses and decision makers. Prominent examples include both recurring and non-recurring assessments, such as the Global Environment Outlook (GEO), the Intergovernmental Panel on Climate Change (IPCC), the Global Biodiversity Outlook (GBO), the Millennium Ecosystem Assessment (MA) and the International Assessment of Agricultural Science and Technology for Development (IAASTD). Over the past four decades, GEAs have evolved to become arguably the most elaborate, systematic, and formally structured dimension of the science-policy interface. At present, a number of new assessment initiatives are under way that are shaping the next generation of GEAs. Among these are the sixth iteration of GEO, the recently established Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and new activities of the International Resource Panel.

A lively discussion has emerged in recent years wherein observers and assessment practitioners, reflecting on past experiences, have put forth appeals for a range of GEA reforms in various intergovernmental fora, as well as numerous opinion articles, commentaries, and editorial news features. These debates were triggered in part by controversies regarding the IPCC, specifically errors detected in the Fourth Assessment Report (AR4) and the release of confidential emails from a server at the University of East Anglia's Climatic Research Unit in November 2009. These highly publicized events sparked a barrage of criticism over the legitimacy, openness, and transparency of certain IPCC assessment procedures and structures. But in the intervening years of this incident—the so-called "climategate"—deeper and more fundamental GEA challenges beyond procedural and structural concerns have surfaced from both the scientific and policy communities that are engaged in assessments.

These discussions are largely motivated by concerns over the efficacy of GEAs as key tools to bridge science and policy. A few examples serve to illustrate the broad variety of topics that have been raised in these recent debates. For example, many observers have highlighted the challenges arising from the magnitude and rising epistemic complexity of existing knowledge assessments, which endeavor to review all available scientific literature, thus putting significant strain on globally available academic resources (Hulme, 2010; Nature, 2013; Stocker, 2013; Griggs, 2014). This has given rise to proposals for reconstituting GEAs into smaller, more focused, and faster assessments (e.g., Hulme, 2010; Price, 2010; Nature, 2013; Stocker, 2013) or transforming them into more flexible Wikipedia-style digital platforms (Christy, 2010). Another challenge that is articulated increasingly is the need to enhance the treatment of policy analysis within GEAs and, more specifically, to strengthen the analytical and methodological frameworks that can facilitate meaningful investigations of the public policy options that countries and the international community have at their disposal (Edenhofer and Minx, 2014; Schiermeier, 2014). Related proposals include a call for greater inclusivity and integration of different knowledge systems, as well as the strengthened engagement of social scientists in GEAs (Perrings et al., 2011) in order to enable the production of GEAs focused on policy assessment (Hulme, 2010).

Controversies have also arisen around the roles and authority that different actors and stakeholders hold in the GEA process. These concerns have motivated certain GEA proponents to suggest a stronger organizational separation between the spheres of science and policy (Christie, 2010; Victor et al. 2014; Stavins, 2014), while others have argued for a modification of these existing interrelationships (Jasanoff, 2010; Hulme *et al.* 2011; Dubash *et al.* 2014; Edenhofer and Minx, 2014). Another area of contention increasingly debated in the context of GEA reform is how assessment processes mediate the inherent conflicts, disagreements and clashes that occur when knowledge is aggregated through meta-analyses and multiple views are balanced. Here, various experts have suggested implementing measures to include the explicit consideration of multiple divergent viewpoints including the normative dimension of the public policy issues treated in GEAs (Pielke, 2007; Hulme, 2009; Sluijs *et al.*, 2010; Betz, 2010; Edenhofer and Minx, 2014). Sutherland (2013) proposes the use of formal procedures and data gathering methods, such

as the Delphie Technique, to ensure that adequate and balanced consensus can be achieved.

While this brief synopsis of recent debates illustrates the timeliness and importance of such a critical reflection on GEAs, relatively little systematic empirical research on GEAs adopting a broader scope has been published since the mid-2000s.[1] This is likely attributed in part to the significant body of novel scholarly research that emerged during the 1990s and early 2000s, for example, through the efforts of the Social Learning Group (2001a, b) and the Harvard Global Environmental Assessment Project (Jasanoff and Martello, 2004; Farrell and Jäger, 2005; Mitchell et al., 2006s)[2]. One of the prevailing outcomes or conclusions of the Harvard GEA project, as elaborated in numerous publications by dozens of scholars, has been and remains highly influential for guiding the conceptual thinking, analysis and practical design of GEA processes: The effectiveness of GEAs critically depends on their perceived salience, legitimacy and credibility, which in turn, tend to be positively or negatively correlated with a number of GEA design features.

While the essential findings of the Harvard Project remain nearly unchallenged, more than half (60) of the cumulated 100 GEAs were released after 2005.[3] This indicates that most of the novel experience with conducting GEAs has been generated in recent years. In addition, major changes in the broader international environmental governance (IEG) arena; advances in the scientific methodologies, innovations, capacities and knowledge underpinning GEAs; and continuous adjustments in the modalities and application of large-scale assessments have given rise to a number of novel challenges related to the design and conduct of GEAs. These considerations and the ambition to contribute to research that seeks to understand knowledge co-generation in international science-policy interfaces that underpin environmental decision making (e.g., Fazey et al. 2013; Vogel et al. 2007; Salter et al. 2010; Pestre, 2003) have constituted the background, motivation and starting point for a collaborative research initiative called The Future of Global Environmental Assessment-Making (FOGEAM). The Mercator Research Institute on Global Commons (MCC) [4] and the United Nations Environment Programme (UNEP) formally initiated this collaborative initiative in April 2013. It is intended to inform future choices for a range of contemporary assessment processes, including the next iteration of the GEO series. This intermediate report summarizes the preliminary findings drawn from the work conducted under FOGEAM thus far.[5]

The aim of this report is to contribute to enhancing the understanding of GEAs by means of exploratory case studies and an empirical analysis of past GEAs—particularly GEO-5 and theory development—that build on scholarship from diverse and relevant strands of literature to inform the strategic design of future GEAs. We deliberately use the term GEA "design" to emphasize our ambition to improve the understanding of how the objectives, means,[6] and consequences of GEAs are interrelated and how they inform assessment process design choices prior to and during the conduct of future GEAs. By employing the term "strategic," we indicate our attempt to shed light on how objectives, means, and consequences of GEAs interact with the broader dynamic context of GEAs, including relevant political, societal, and scientific processes, so as to facilitate the deliberate design of future GEAs. In short, this report aims to inform future deliberations of GEA designs between scientists, policymakers, and other stakeholders engaged at the science-policy interface. It reviews existing relevant empirical literature and introduces novel conceptual terminology and information about key relationships between GEAs and their environments, including selected analyses of more specific GEA design elements (such as policy assessments, responding to diverging viewpoints and stakeholder engagement).

This is clearly an ambitious agenda. GEAs are situated in the dynamic and rapidly evolving domains of international environmental governance and scientific knowledge production. As such, sustained efforts to analyze GEAs must also carefully consider that knowledge related to these domains is continuously changing. A better understanding of the complex

[1] The Inter Academy Council (IAC, 2010) inquiry into the IPCC may have come closest in recent years to meeting the criteria of broad, systematic, and empirical analysis of a GEA. For additional and more recent GEA analyses of adopting a broader scope, see Kok et al. (2008, 2009) and Rothmans et al. (2009). More specific analyses of various GEA aspects published in recent years are reviewed in the individual chapters of this report.

[2] See http://www.hks.harvard.edu/gea/ for an overview of the many publications related to the Harvard GEA project. Additional contributions to the reflection and analysis of GEAs during the 1990s and early 2000s include Pinter (2002), Cash et al. (2003), Siebenhuener (2002, 2003), Haas (1992) and several others. More specific analyses of various GEA aspects published in this period are considered in the individual chapters of this report.

[3] See Figure 2.X in Chapter 2 of this report.

[4] The MCC is an independent research institute that was established in 2012 (see http://www.mcc-berlin.net/).

[5] See Annex A for more details on the setup of the FOGEAM project.

[6] Including methods and methodologies, processes, modalities, institutional settings and resources, such as time, money and expertise employed in GEAs.

interrelationships of GEA design features, as well as developing and updating this new and evolving field of study, can potentially facilitate and perhaps improve the future allocation of scientific resources.

Against this background, this report tackles the following six specific tasks:

- Offering an overarching conceptual framework for analyzing and evaluating GEA objectives, means and consequences embedded in their wider societal context;
- Providing a retrospective analysis of the evolution of the GEA landscape and contexts in which assessments have been conducted and delivered over the past four decades;
- Suggesting a perspective on the types of impacts that can reasonably be expected from GEAs;
- Reflecting on options for enhancing policy assessments within GEAs;
- Analyzing different general approaches in GEAs for responding to divergent viewpoints and better understanding the conditions under which they can be effective;
- Considering the promises and challenges of stakeholder engagement in GEAs.

Any attempt to empirically analyze GEAs faces substantial methodical challenges, as they remain a relatively new and continuously evolving social phenomena. Moreover, they often involve hundreds, if not thousands, of experts and other stakeholders who are engaged in complex interactions embedded in multifaceted international governance structures that are processing vast amounts of information on highly complex coupled natural and social systems. Gaining necessary access to the inner workings of a GEA's process—a typically restricted or exclusive enterprise—is a significant methodical challenge for social science research. There is, for example, an ongoing formal process within the IPCC to determine if, and under what conditions, researchers may join closed-door IPCC events and proceedings to conduct participatory observation (IPCC, 2013; Hulme and Mahony, 2013). The chapters in this report apply multiple mutually reinforcing social science research methods in order to tackle and manage this challenge. The main methodical approaches employed include:[7]

- Extensive literature and document review and analyses, and conceptual reflection. The peer-reviewed literature includes publications directly related to GEAs, as well as other streams of literature related to key issues of GEAs, including contributions from science and technology studies (STS), philosophy of science, public policy analysis and stakeholder engagement. The documents considered are background documents, scoping papers, meeting reports, independent evaluations, official United Nations documentation, government reports, news articles and, of course, the assessment publications themselves;
- The compilation and analyses of a GEA metadata catalogue composed of information on 20 large-scale assessments;
- Eighty-two semi-structured interviews with individuals engaged in various GEAs. At least 56 of the interviewees participated in the GEO-5 process. Interviews were mainly conducted via Skype and telephone between August 2013 and July 2014. They lasted 55 minutes on average and anonymity was assured. All interviews were recorded and transcribed with the participants' prior consent and MAX QDA was used to facilitate coding and analysis;
- A two-day experts' workshop with authors involved in GEO-5 was held in Berlin in October 2013 to identify and discuss lessons learned from GEO-5 and other assessments;
- Reflections and discussions with the project team members regarding their personal experiences with various GEAs. One team member (Jabbour) was part of the production team of GEO-5 and another (Flachsland) was a contributing author to the IPCC AR5 Working Group III Report;
- Numerous informal conversations and discussions, as well as workshops were held with Secretariat staff from UNEP-DEWA, members of the IPCC AR5 WGIII Technical Support Unit, located near Berlin, IPCC Co-Chair Ottmar Edenhofer (also Director of the MCC), several other IPCC authors from the Potsdam Institute for Climate Impact Research (PIK) and the MCC, and with experienced scholars working on the science-policy interface and international environmental governance.

The report features six core thematic chapters complemented by this introduction and a summary of key recommendations. The six core chapters mutually inform each other and address selected aspects of GEAs along the following line of thought: A recent shift to more solution-oriented GEAs can be

[7] See Annexes B–E for more details on these methodical approaches.

observed in line with changes in the environmental-political context. This shift in the focus of GEAs gives rise to new challenges and, therefore, requires a new reflection on the alignment of envisaged impacts, objectives, means, and resources in GEAs. This requires an appropriate GEA impact strategy, including the definition of target audiences and key policy questions to be addressed by GEAs. Based on that, an adequate methodology and research organization for such solution-oriented public policy analyses must be developed, and effective strategies to respond to manifold divergent viewpoints, which inevitably occur in the discussion of policy options, are needed. A promising avenue for solution-oriented GEAs in that regard could be the interdisciplinary mapping of alternative policy pathways and their practical implications related to multiple policy objectives in selected regions and thematic fields. In this model, researchers act as cartographers of the solution space, while policymakers act as navigators deploying policy means. The effective engagement of stakeholders in GEAs is crucial to realizing this and other purposes of GEAs. This line of thought builds on the overarching conceptual framework developed for this project.

Chapter One presents the objectives-means-consequences (OMC) conceptual framework developed in the FOGEAM project, which supports the analysis, evaluation, and strategic design of GEAs. It provides the meta-framework and terminology for the analyses in the subsequent chapters. The OMC framework builds strongly on existing scholarship on GEAs, but puts particular emphasis on the dynamics of (i) the wider political context of specific GEAs for strategically determining their envisaged impacts and corresponding operational objectives; (ii) the various means employed in the conduct of GEAs (including methods and methodologies, processes, modalities, institutional settings and resources, such as time, funds and expertise) to attain these objectives; and (iii) the actual consequences of GEAs brought about by employing these means, as well as their relationships to the initially envisaged impacts and objectives. Emphasis on the complex relationships between and options for attaining consistency in the objectives, means, and consequences of GEAs on different levels is a key analytical theme of each of the chapters in this report.

Chapter Two provides an empirical elaboration of the dynamic dimension of the OMC framework and offers a coarse reconstruction of the historic co-evolution of the political context, objectives and means employed in GEAs over the past four decades. The chapter examines how and why elements of organizational design, objectives and means—against the evolving political backdrop—depend on one another. It begins with the empirical observations that the genesis of GEAs is closely and significantly connected to the birth of environmental multilateralism; that the complexity of GEAs has increased significantly because more is being demanded of and expected from GEAs today compared with first-generation assessment processes; and that despite criticisms, the demand for and investments in large-scale high profile assessments remain significant today. The principal argument of the chapter is twofold. First, as a response to changes in their political context, contemporary assessments are undergoing a transformational shift from predominantly problem-based knowledge syntheses towards solution-oriented enterprises. Second, as a result of this shift and the subsequent manifestation of increasing demands by multiple stakeholders at the international science-policy interface vis-à-vis assessments, there is a critical and widening incongruence between the ambitions (i.e., the envisaged consequences and objectives) of GEAs and the available means through which they can be carried out effectively.

Chapter Three explores one of the most central and complex questions in research on GEAs: How can GEAs contribute to policymaking processes and, in particular, inform public policy discourses? And how can the potential impacts of GEAs—those that they can be reasonably expected to achieve, or not—be evaluated? The chapter proposes the adoption of a nuanced view of the potential impacts of GEAs. In particular, it suggests that the main impact of GEAs on policymaking occurs via their contributions to public policy discourses, in particular by providing reliable answers to key public policy questions. These public policy discourses, in turn, provide discursive resources in political decision-making processes, thus impacting the formation of public policies along with other relevant factors. Relying on an extensive empirical exploration of the impacts of GEO-5, the chapter confirms that GEAs can and do inform policy discourses in various domains and through various audiences. Actors engaged in the production of assessments, including lead authors, are identified as particularly important channels that transfer GEA findings to policy discourses. At the international level, GEO-5 contributed various topics to policy discourses in the run-up to the Rio+20 Conference and in the construction of the post-2015 Development Agenda, including the initiation of the Sustainable Development Goals. At the national level, GEO-5 also informed

policy discourses through various channels in some regions. However, many interview respondents claim that the broader public dissemination efforts for GEO-5 suffered from the limited resources allocated to communications and outreach. One important lesson drawn from the interviews with GEO-5 participants is that a lack of precise definition for envisaged impacts, and/or the misalignment of these envisaged impacts with available resources, can impede the execution of the assessment and the achievement of the envisaged impacts. A key emerging lesson is that establishing clear expectations concerning the envisaged impacts at the beginning of the GEA process in cooperation with all relevant stakeholders, and consistently and systemically translating these envisaged impacts into the choice of appropriate objectives and means is critical for success.

Chapter Four builds on the preceding chapters by focusing on the opportunities and challenges related to policy analyses in GEAs. Public policy assessments in GEAs are conceptualized as efforts to address policy questions, such as: Are we on track to meeting policy objectives? What is preventing us from attaining certain policy objectives? Which policy instrument combinations and institutional setups have actually worked to achieve a set of objectives in the past? Which alternative policies would achieve alternative sets of objectives in the future? Addressing these and other questions can inform discourses that lead to the eventual formation of public policies. In responding to such public policy questions, GEAs can provide reliable knowledge on how multiple social objectives are affected by the complex interplay between social, technological, economic and natural systems and how policy instruments can change the future relative probabilities of attaining these objectives. The specific opportunities related to public policy assessment in global-level GEAs are (i) to facilitate effective international policy coordination by establishing a globally shared reliable policy knowledge base and (ii) to potentially catalyze policy learning and policy diffusion across regions and stakeholder groups, thereby improving the quality of policymaking. The chapter emphasizes that addressing different public policy questions require different methodical and disciplinary approaches, as well as the involvement of different communities of practice who can develop the necessary expertise. A review of selected experiences with policy assessments in GEAs highlights the benefits of specifying carefully and explicitly the precise policy questions and the considered domains (regions, environmental and economic sectors, timescales, etc.) addressed in the GEAs. Such a review also ensures the required resources are made available (conceptual frameworks, methodologies, resources, and expertise as embodied in communities of practice) and fosters the development of communities of practice outside of formal GEA processes that can tackle the specific policy questions raised by the GEAs.

Chapter Five investigates the challenges related to the treatment of divergent viewpoints in GEAs (substantive and normative), including scientific, institutional, political, ethical, and other viewpoints. This is acutely relevant given that opposition to GEAs in general, and the uptake of their findings in particular, has been attributed to GEAs being perceived as one-sided or overtly policy-prescriptive. More generally, insofar as GEAs contribute to addressing public policy questions and the opinion-formation of relevant stakeholders—which in turn impacts the formation of public policies—productively responding to divergent viewpoints within the GEA bears direct relevance to the conduct and outcome of public policy processes. A shift toward solution-oriented enterprises has the potential to reinforce this challenge in the future, as assessments will likely engage more closely with public-policy options that are contested in domestic and international public policy discourses. The chapter develops a typology of how divergent viewpoints are empirically (or might be conceptually) treated in GEAs. These strategies range from routine everyday procedures (e.g., enhanced communication and clarification of what is meant by specific statements, scientific peer reviews and reaching scientific consensus, and negotiating compromises between authors and governments) to more complex, long-term approaches. The chapter also initiates a discussion on the empirical and potential benefits and drawbacks of the various approaches by acknowledging the significant methodical challenges of such an exercise. A key hypothesis emerging from the discussion is that in the case of heated and complex cases of policy assessments (e.g., due to different sets of policy objectives held by different stakeholders), it seems most promising for solution-oriented GEAs to explore the practical implications (e.g., trade-offs, overlaps, winners, losers, risks and uncertainties) of alternative policy pathways.

Chapter Six explores the general and operational objectives and formats for stakeholder participation in GEAs, while providing a theoretical discussion on who can be considered a stakeholder. Four overarching objectives for engaging with stakeholders in the

GEAs identified in the literature are (i) to ensure the legitimacy of the assessment, (ii) to foster deliberation between stakeholders, (iii) to enhance ownership by stakeholders and (iv) to engage with stakeholders as additional sources of information. Building on the OMC framework detailed in Chapter 1, this chapter proposes a conceptual framework to analyze the objectives, means, and consequences of different formats with varying modalities for stakeholder engagement in GEAs. This conceptual framework is applied to an analysis of regional stakeholder consultations, as well as the summary for policymakers (SPM) resulting from the GEO-5, IPCC AR5 WGIII and IAASTD meetings. The chapter also emphasizes the value of clearly specifying and aligning the objectives and organizational modalities of specific GEA stakeholder engagements to ensure the objectives will be met.

Finally, **Chapter Seven** summarizes the key recommendations that have emerged from the six core chapters, while the five Annexes provide background information on the FOGEAM project and the methods that were employed.

Given that the analyses of the semi-structured interviews, questionnaires and relevant documents is ongoing, the authors of this report emphasize that the statements, observations, and early results presented here should be considered preliminary, tentative, and as works in progress. Despite this caveat, we hope that these preliminary findings can be useful for informing and stimulating thinking about the design of future GEAs and, in particular, a sixth iteration of GEO. Comments from any reader of this document, at whatever level of detail, are highly appreciated and welcome.

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Chapter 1

A strategic conceptual framework for the analysis and design of GEAs

ABSTRACT

A better understanding of and continuous reflection on global environmental assessment (GEA) processes is useful for ensuring and enhancing their effectiveness in bridging science knowledge and policy action, particularly in light of evolving challenges at the science-policy interface. This requires appropriate conceptual tools and a standardized terminology to discuss the highly complex aspects of GEAs. Building on existing analytical approaches, this chapter proposes a new conceptual framework: The objective-means-consequences (OMC) framework, to support the analysis, systematic evaluation, and strategic design of GEAs and their embedded processes. It also provides key analytical tools and standardized terminology for the subsequent chapters of this report. The OMC framework suggests a strategic perspective on GEAs by shifting attention toward the interrelations between (i) the existence of different types of objectives within GEA processes (e.g., those developed in formal mandating processes), (ii) the choice of means that are employed to achieve these objectives (e.g., methods, procedures, and organizational processes, including those related to time-frames, funding, and available expertise), and (iii) the actual consequences. The analysis of both positive and negative consequences or implications of employing these means is decisive for the evaluative function of the OMC framework. Undesirable consequences could necessitate both the revision of means, as well as objectives in future (or ongoing) GEAs. Finally, the OMC framework also enables the analyses of interactions of GEAs with their broader dynamic contexts, including relevant political, societal, and scientific processes and discourses.

Key messages

1. The objective-means-consequences (OMC) conceptual framework offers a terminology to support the systematic evaluation and the strategic design of global environmental assessments (GEAs). It can also serve as a tool to support continuous reflection on the efficacy and suitability of GEAs.

2. The OMC framework guides attention towards the continuum and interdependency of the various objectives, means, and consequences within a given GEA processes.

3. The framework enables, in particular, (i) an analysis of the dynamic co-evolution of GEAs and their ever-changing political, societal, and scientific context; (ii) a focus towards the key challenges and response options in past and future GEAs; and (iii) a more systematic evaluation of GEAs, facilitating the inquiry on effective leverage points for improving GEA processes.

4. Analyzing the positive as well as negative consequences of the different means employed to achieve the various objectives of GEAs, and comparing actual consequences with the original objectives, can inform future GEA design choices.

5. There is a need to strengthen the systematic alignment of objectives, means, and consequences in the design and production of GEAs.

6. The OMC framework can be employed by policy-makers, scientists, and other stakeholders at the science-policy interface to structure open discussions and deliberations about lessons learned, impacts and design choices for emerging GEAs, including on their respective roles in these processes.

1.1 Introduction

Global environmental assessments (GEAs) have proven to be useful tools at the international science-policy interface vis-à-vis their capacity to provide systematic, comprehensive, and authoritative syntheses of the best available knowledge in a highly collaborative and participatory manner. To ensure and enhance the effectiveness of GEAs in light of evolving challenges, an improved understanding of and continuous reflection on GEAs is both necessary and helpful. This is particularly relevant, given the recent fundamental shifts in GEAs and their contexts, including the discernible move toward solution-oriented assessments (see Chapter 2). These shifts present new challenges for the design of GEAs, as well as opportunities to improve their utility. As such, analyzing and learning from past and current GEAs is essential.

Such systematic reflections on GEAs—and even basic descriptions of complex GEA processes—require deliberate and careful conceptual tools, as well as a standardized terminology as starting points for analysis. This is necessary as GEAs and their related contexts, processes, outputs, and outcomes are highly complex phenomena that are difficult to grasp in conceptual terms. The expert interviews conducted for this FOGEAM research initiative (see Annexes) confirmed this hypothesis. Most of the respondents faced tremendous challenges with conceptualizing and pinpointing the appropriate terminology (and syntaxes) to express their views about particular aspects of the GEA process.

Addressing the considerable challenge of conceptualizing and analyzing GEA was a key goal of the seminal and extensive Harvard Global Environmental Assessment project (see Introduction chapter). The Harvard GEA project provides one of the most comprehensive and influential frameworks for conceptualizing GEAs and is supported by an impressive collection of empirical case studies.[1] At its core, the framework advances the notion that the effectiveness of GEAs critically depends on their perceived salience, legitimacy, and credibility, which, in turn, correlates positively or negatively with a number of GEA design features. This perspective emphasizes the need to analyze the conditions under which GEAs can be influential in the political and public realm, and which design features and pathways can foster such influence. The framework also directs attention, in principle, towards the political, socio-economic, and environmental context in which GEAs emerge, operate, and potentially exert influence in order to understand the conditions affecting their impact. Another conceptual framework for analyzing GEAs is that of the National Research Council (2007); also informed and inspired by the Harvard approach. This body of work provides a useful overview of the relevant analytical questions for investigating GEAs.
While the frameworks presented in these and other bodies of work are very useful contributions, we argue that further refinement and differentiation is overdue. In part, because important shifts in the contexts and orientations of GEAs that have taken place in recent years, and the resulting new challenges and opportunities that contemporary GEAs face. Understanding the dynamic historical co-evolution of GEAs and their contexts, which are critical for aligning GEAs to their current challenges (see Chapter 2), is difficult to achieve using these frameworks.

Drawing heavily on the existing analytical approaches to GEAs, this chapter introduces a novel and refined conceptual model: the Objective-Means-Consequences (OMC) framework. The proposed OMC framework aims to support the systematic analysis, evaluation, and design of GEAs. Similar to the previous approaches mentioned above, the OMC framework considers both the design features of GEAs and the context within which GEAs are embedded, along with the interrelationships between design and context. It also considers more systematically the large variety of actors within GEA processes and their various objectives and motives for engagement. While the OMC framework strives to facilitate the integration of insights on general GEA design principles derived from previous research, including the three GEA criteria of salience, legitimacy, and credibility, it also allows for the identification of additional or refined criteria in more specific contexts.

The OMC framework goes beyond the existing frameworks and enables a more flexible and strategic perspective on GEAs and their perceived utility at the science-policy interface. It allows for the identification of key issues in contemporary GEAs regarding their effectiveness,[2] which in turn facilitates a more detailed systematic analysis, as explained below (see Sections 1.2 and 1.3). Moreover, the framework takes into account the dynamic aspect of the potential co-evolution of

[1] See http://www.hks.harvard.edu/gea/ for an overview of the many publications relating to the Harvard GEA project, see in particular Clark et al., 2006, Figure 1.1.
[2] This is how the OMC framework justifies the choice of the themes and topics addressed in the present draft report (see the introduction to this draft report for an overview).

GEAs and their contexts. Moreover, the framework takes into account the dynamic aspect of the potential co-evolution of GEAs and their contexts. In attempting to guide and organize the research presented in this draft report, the OMC framework provides a meta-framework and standardized terminology.

Finally, the OMC framework places particular emphasis on the various objectives within GEA processes and on the choice of means employed to achieve them. Inquiries into the positive and negative consequences of these means based on initial objectives of the GEAs allow the OMC framework to serve as a tool for guiding evaluation. Thus, insights gained from such analyses and evaluations can inform discussions about the design of future GEAs.

1.2 OMC: Core idea and theoretical underpinnings

The underlying assumptions the OMC framework stem from philosophical pragmatism (e.g., Dewey, 1986 and 1988; Putnam, 2004). Interpreting GEAs from a "pragmatic" and practical perspective implies focusing on the purposes (i.e. the objectives of GEAs) and the level of success in achieving those objectives.
GEAs typically have mandates that are specified in the political (intergovernmental) domain. In the case of the GEO series and IPCC, the operating mandates are specified within an intergovernmental setting. Assessments usually aim to effectively inform policy, stakeholders, and the public in terms of the most up-to-date and robust scientific developments. Given the close interactions between assessments and the (constantly changing) broader political and societal contexts (see Chapters 2 and 3) in terms of GEA objectives, the aim is to better understand the objectives, means, consequences, and the factors that are decisive for improving the utility of GEA outcomes. Thus, inspired by philosophical pragmatism, OMC-guided analyses are characterized by their functional views of GEAs. This perspective on the level of and conditions for achieving the objectives of GEAs is what we call the "strategic" perspective of GEAs—in contrast to approaches that are built on more specific theoretical and descriptive research interests.

Given this background, the OMC framework focuses on analyzing different objectives in GEAs (in terms of vague goals, concrete targets, explicit or implicit objectives, etc.), the various means to achieve those objectives, and the subsequent consequences (i.e. practical implications of these means). Such objectives and means can occur on different levels throughout the GEA process. This is due to the fact that there is a large and evolving continuum of objectives and means in GEAs. The means to achieve specific objectives can be interpreted as objectives that require their own means in order to be achieved. For instance, the GEA objective of analyzing the best practices for policy in a specific region requires scientific methods for public policy analysis (e.g. careful counterfactual analysis). To realize a successful application of these methods sufficient resources, such as funds, time, and expertise are required. This implies that scientific methods can be interpreted either as means or objectives, depending on the context.

Certainly, most people would agree with the core idea of the OMC that focusing on objectives, means, and consequences is useful and important from a strategic perspective when evaluating and designing GEAs. However, neither the GEA practices nor the literature on GEAs always reflect this insight in an adequate manner. The OMC framework may be useful to address this shortcoming. The main contribution of the OMC framework to the debate is that the OMC framework allows for (1) the identification of the most salient issues in contemporary GEAs and (2) the detailed and systematic analysis and design of very specific elements and aspects of GEAs. These two effects are possible because the OMC framework has been developed as a broad and flexible conceptual framework, instead of, for instance, focusing on pre-determined fixed topics or criteria. Against this backdrop, applying the OMC framework to GEAs primarily requires an open analysis of the key obstacles to the overall effectiveness of contemporary GEAs, which can be regarded as the most "salient" issues from a strategic perspective. Effect (2) is possible because of the very fundamental pragmatist and functionalist rationality of the OMC framework, which allows for its application to a broad range of cases and issues.

Moreover, a dynamic perspective on the continuum of objectives, means, and consequences in GEAs is decisive for the framework developed here because GEAs and their contexts evolve over time. Changes in GEA contexts (including, for example, changes in the international environmental agreements) lead to changes in their design and conduct which is discussed in Chapter 2. Thus, the OMC framework addresses the continuously changing relationship between the objectives, means, and consequences (including trade-offs, obstacles, synergies, conditions of success, etc.) in GEAs on different levels. As such, the OMC framework

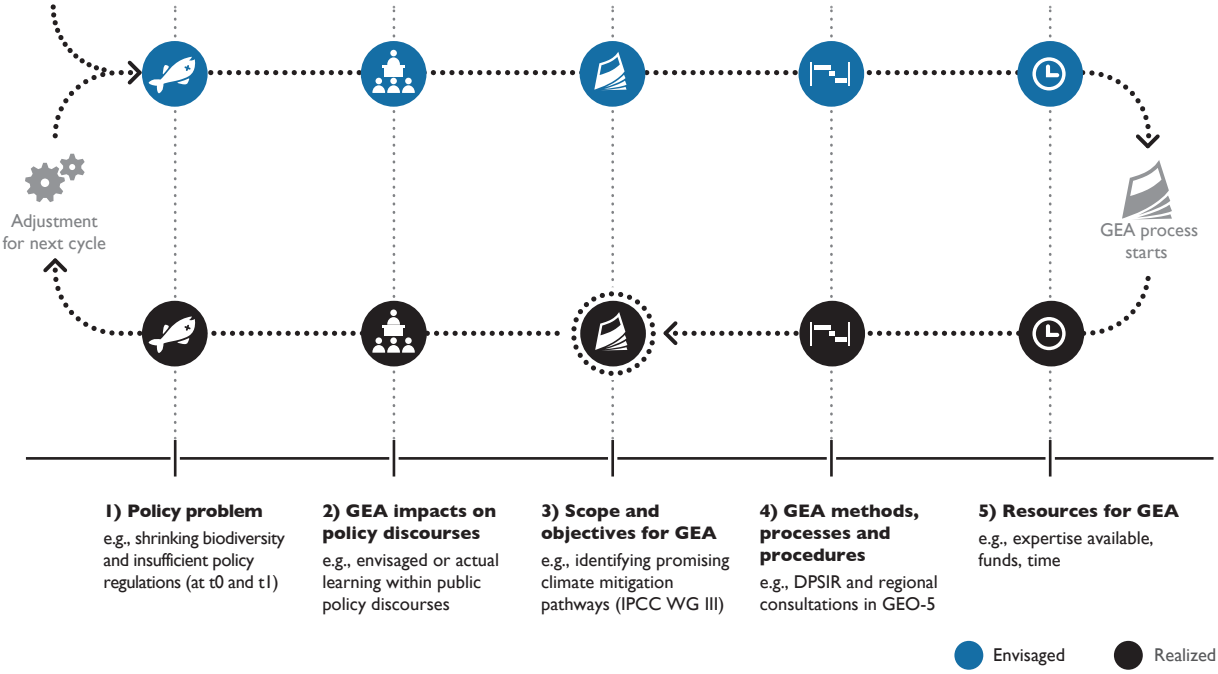

Figure 1.1. – Key research objects of the OMC framework for analyzing, evaluating, and designing GEAs. *This figure shows elements of a GEA process in a stylized manner that are central to inquiries into GEAs employing the OMC framework. The order of these research objects in Figure 1.1 is based on the logical interdependency of objectives, means and consequences. It therefore refers to an analytical logic, rather than to a temporal sequence in real-world GEA processes. The research objects are central to the analysis, evaluation and design of GEAs. For simplification, the following explanation of Figure 1.1 assumes the evaluative function of the OMC framework.*

is not primarily actor-centered, but the actors play a central role, primarily in the sense that they are the bearers of the objectives.

Having introduced the theoretical rationale and background of the *analytic* function of the OMC framework and the related strategic research interests, what remains to be explained is how this framework can be used to *evaluate* GEAs, thus implying a rather normative function. Given the Deweyan philosophy of the interdependency between objectives and means, objectives can only be evaluated by analyzing the practical consequences of the means chosen to achieve those objectives.

Obviously, the means should be replaced if they do not have the desired outcome (i.e. because they are ineffective). Less obvious is the pragmatist idea that objectives have to be revised or even abandoned if the best available means turn out to be ineffective at achieving their objectives or turn out to have massive unwanted side effects and trade- offs.[3] Hence, the analysis of objectives, means, and their consequences in GEAs can serve as the basis for their evaluation.

Using the OMC framework as a tool in the design of future GEAs builds on the same theoretical assumptions as its evaluative function. The difference however, is that while evaluation can be done by adopting an *ex post* perspective, the design of GEAs has to adopt an *ex ante* perspective on the possible consequences of the different means in GEAs.

1.3 Major elements of a GEA process in light of the OMC framework

This section describes in more detail the OMC framework as a conceptual framework for analyzing, evaluating, and designing GEAs in light of the dynamic interrelations that exist between their objectives, means, and consequences. Key research questions on GEAs that can be answered using the OMC framework include:

- What are the broader dynamic contexts of GEAs, including the relevant political, societal, and scientific processes, as well as the state and trends of the environment, with which GEAs interrelate? What are the actual and potential roles of GEAs in these contexts?

[3] Co-benefits (synergies) play a decisive role in evaluations. The evaluative criteria are also derived from more general assumptions about the appropriate roles of GEAs (which again refer to a certain kind of high-level objectives) in the political arena, in terms of, for instance, salience, legitimacy, and credibility (Cash et al., 2003), which can be interpreted as objectives for GEAs.

- Do the chosen objectives for GEA reports help to achieve the envisaged impacts on the given political, socio-economic, and environmental context?
- Which GEA methods, processes, and underlying resources are used or required to achieve the objectives of the GEA reports?

Given this assumption, the upper half (the elements in blue) can be interpreted as a continuum of originally envisaged objectives and means on different levels of a GEA process, for example during the mandating process for a planned GEA. In contrast, the lower half (the elements in black) can be regarded as the actually implemented means and their actual implications and consequences (from the right to the left). The right-hand side of Figure 1.1, including the envisaged and the realized elements of the categories called "Scope and objectives for GEA," "GEA methods, processes and procedures," and "Resources for GEA," addresses aspects within assessments, while the elements on the left-hand side concern the context of GEAs (public realm).

In general, the strategic evaluation of GEAs requires primarily a focus on the central objectives, the extent to which they were achieved, and the major factors (e.g., GEA design features, conditions) leading to that outcome. The logical starting point for such a strategic evaluation of GEAs is the perceived environmental policy challenge prior to a GEA process, and the related goals to overcome it. This is indicated by the upper element of the "Policy problem" category (in blue). It can refer to a particular political, socio-economic, and environmental situation, as well as to specific governance levels that a GEA process is situated in, including the relevant political, societal, and scientific processes. In general, GEAs can be conceptualized as responses to such environmental policy challenges. A simplified example is the situation in the 1980s where plausible scientific hypotheses and evidence regarding anthropogenic global climate change and its possible implications for humankind existed, but were accompanied by high uncertainty and fundamental research gaps. The possible risks of climate change for humankind were perceived by some as a problematic situation to be overcome.

This leads to the need for a better understanding of the originally envisaged GEA impacts (the upper element of "GEA impacts on public discourses" in Figure 1.1). This element can be interpreted as the means that are expected to achieve the objective of tackling the problematic situation (upper element of "Policy problem"). In the case of climate science in the 1980s, an example of envisaged impact is the hypothetical assumption that if more people, including policymakers, could be convinced to regard climate change as a serious risk to humankind, the result would be collective action towards ambitious and effective climate change mitigation, thereby solving the problem described in "Policy problem." More detailed reflections on envisaged impacts of GEAs are discussed in Chapter 3 of this draft report, particularly in terms of impacts on learning within policy discourses.

In accordance with the here proposed OMC framework, the next logical step of the GEA evaluation is to analyze the means in terms of what the GEA was expected to deliver (upper element of Scope and objectives for GEA) in order to realize the envisaged impacts.[4] Thus, although the upper element of "GEA impacts on public discourses" has been analyzed above as the means to overcome the perceived policy problem, it now becomes an objective as well. A hypothetical example for the "Scope and objectives for GEA" (for example, in order to convince more people that anthropogenic climate change is real, as the envisaged GEA impact), can include the establishment of a credible and legitimate scientific consensus on the existence of global anthropogenic climate change in the outputs (assessment reports, press releases, etc.) of the GEA process.

Following the same logic of objectives and means, the evaluation of a past GEA will then focus on the envisaged activities and practices (upper element of "GEA methods, processes and procedures") that are intended to help achieve the envisaged "Scope and objectives for GEA." Examples include the DPSIR framework[5] and stakeholder engagement through regional consultations (see Chapter 6) employed within the GEO-5 process, as well as scientific peer review processes to establish scientific consensus on the existence of anthropogenic climate change in the IPCC assessments. To realize these envisaged GEA activities and practices in terms of methods, processes and procedures, certain resources in terms of personnel, time, and funds were allocated

[4] The elements of the category "Scope and objectives for GEA" refer to a specific GEA mandate, a set of objectives for the analyses done in a GEA, and the scope of the assessment, and key storylines and envisaged key messages. It may, however, be difficult to avoid conceptual confusion here because the standard terminology in the context of the GEO community, for instance, is to talk about GEA objectives in this specific context. We also use "objectives" as a very general term for all kinds of strategically interesting goals on different levels of a GEA process.

[5] DPSIR stands for "driving forces, pressures, states, impacts, responses."

to GEAs as means to realize the envisaged processes and procedures and the application of the selected methods and methodologies.

Having understood the various envisaged objectives and means prior to a past GEA process, the evaluation of the GEA can continue with the critical analysis of the *actually* employed resources, methods, processes and procedures and the – along with many other factors – resulting outputs and outcomes of a GEA process as well as their impact on policy discourses and the political and environmental context. An evaluation has to compare the various objectives with the actual consequences, given the multitude of factors and conditions inherent in a complex real world that rarely allows for the undisturbed attainment of objectives on different levels of the GEA process. A GEA evaluation should identify the conditions of success or failure of means to achieve given objectives, in terms of obstacles, direct effects, unwanted side effects and potential synergies. This allows for an evaluation of the means and possibly for a revaluation of the objectives in order to learn for future GEA process design (see Section 1.2 for the underlying pragmatist philosophy). For example, it might turn out that, on the one hand, the objectives for the GEA were achieved quite well – for instance, the establishment of a consensus in a GEA on a previously disputed scientific issue. On the other hand, the envisaged GEA impacts – for instance, the goal of convincing decision-makers that climate change is a serious threat to the global community – were perhaps not achieved. Nor would there be a significant change in the environmental policy problem at stake in this hypothetical example. Consequently, for the next assessment cycle either the objectives for the GEA would need to be adapted or the envisaged impacts themselves if there are no adequate means available to achieve them.

In general, the new GEA context ("Policy problem" at t_1) evolves over time based on the GEA outcomes and in particular numerous other factors. In subsequent assessment cycles, the changes in the political context must be taken into account for an appropriate decision on envisaged impacts of the GEA. Thus, emphasizing the dynamic co-evolution between GEAs and their contexts. The elements of the OMC framework presented in **Figure 1.1** are not intended to be exhaustive. More differentiated layers of intermediate means or objectives could be added for more specific research purposes and the existence of additional means employed to achieve a given objective must be taken into account. Thus, the elements in Figure 1.1 focus on what we believe to be the *central* attributes of a strategic GEA analysis or evaluation. For the sake of simplicity, we have not discussed the potential or actual actors related to these objectives, means, or consequences.

By employing the OMC framework, the objectives and means of GEAs can be evaluated on different levels in light of their practical consequences. If the trade-offs are too drastic, even with the best available means, then the GEA objectives need to be revaluated. On the other hand, there can also be unexpected synergies. One of the most obvious examples is to analyze the resources that have been available in past GEAs. From an OMC-based analysis of this aspect, one could learn whether or not resources (time, funds, and personnel) require modification in future GEAs, if for instance public policy assessments in GEAs are to be improved (see Chapter 4). Further examples are provided in Chapters 5 and 6 of this draft report where the OMC framework is used to evaluate approaches to policy-related divergent viewpoints in GEAs, as well as formats for stakeholder engagement in GEAs.

As mentioned above, also the planning and designing of future GEA processes can employ the OMC framework. In this respect, the elements presented on the lower half of Figure 1.1 must be considered in terms of ex ante estimates of probable consequences.

1.4 Conclusion

This chapter offers a conceptual framework for discussing GEAs from a strategic perspective by drawing on the interdependency of objectives, means, and their effects, including the dynamic co-evolution of the GEA context and processes. This can be useful for the analysis, systematic evaluation, and strategic design of GEAs. The central GEA research objects that were introduced above (Section 1.3) by employing the OMC framework are certainly not new. Yet, the OMC framework allows for the identification of various leverage points that can increase the effectiveness of GEAs and can help address their current short-comings. Furthermore, by employing the OMC framework, these various leverage points can be weighed against each other in order to identify the most efficient GEA reform opportunities. The OMC framework can guide such analyses towards (1) the identification of the most salient issues in contemporary GEAs and (2) providing a simple but effective tool to evaluate specific GEA aspects by focusing on the interrelation of objectives, means, and consequences in a given context. This could

promote a more systematic and fruitful discussion about assessments, as well as a continuous valuable learning process on GEA design and effectiveness.

As a conceptual framework and a proposal for creating a standardized terminology for describing GEAs, the OMC framework may also help to map, organize, and structure the empirical discourse on GEAs in the literature and among GEA practitioners. Most of the GEA aspects discussed in the literature, as well as many divergent viewpoints on how best to design future GEAs, can be "located" within the OMC framework. Since continuous critical reflection on GEAs is crucial to ensure their sustained effectiveness, structuring these debates through such a framework could be a valuable contribution. Although it is not compatible with all of the existing approaches to analyze and evaluate GEAs, the OMC framework may also help to integrate valuable insights from the Harvard GEA project, for instance. Yet, the widely accepted GEA criteria of salience, legitimacy, and credibility, as well as their trade-offs (Cash et al., 2003) ought to be analyzed in more differentiated and contextualized manner. This is attempt is made in the subsequent chapters of this draft report. Moreover, various chapters scrutinize specific elements of the OMC framework, and provide elaborations on the interrelations between them.

Recommendations for future GEAs include to (1) facilitate continuous critical reflection on GEA processes in order to learn from past experiences; (2) make the chosen analytical framework explicit to allow for a more open, transparent, systematic, and thorough discussion; (3) take the interdependency and co-evolution of GEAs and their contexts into account when designing them; and (4) explicitly discuss the envisaged impacts of GEAs and their conditions of success, including the role of governments, with government officials and policymakers in a more open and systematic manner. It is our hope that the OMC framework will facilitate such a debate by providing a standardized terminology and fundamental semantic ontology.

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Chapter 2

The dynamic co-evolution of objectives, means and political context

ABSTRACT

The purpose of this chapter is to provide a retrospective analysis of the global environmental assessment (GEA) landscape and the changing character, orientation and dominant focus of contemporary GEAs. We examine how and why elements of organizational design, objectives, means, as well as the evolving political backdrop depend on one another. Building a deeper understanding of potential interdependencies, this chapter seeks to fill critical gaps in practical and empirical knowledge about the complex web of factors that exert influence over the function and perceived utility of GEAs; with a view of informing future processes and more immediately, the recurring UNEP flagship: *Global Environment Outlook* (GEO). The chapter postulates that contemporary assessments are undergoing a transformational shift from predominantly problem-based knowledge syntheses, towards solution-oriented enterprises. A summary of the historical origins of international scientific assessments commences the analysis, revealing that the genesis of GEAs is closely and significantly connected to the birth of environmental multilateralism. An examination of the evolving character of GEAs and the current state of play follows, highlighting present changes and related challenges and limitations facing contemporary GEAs. Our analysis indicates that the current institutional arrangements and processes for GEAs, including fundamental design attributes, conceptual frameworks, and the required means to achieve objectives have not kept pace with the changing political context and reoriented focus that's being demanded of contemporary GEAs.

Key Messages

1. An important and under-appreciated aspect of designing more effective and relevant future GEAs requires an improved understanding of, and alignment with, the dynamically shifting political context that they are conceived and received in;

2. Despite a persistent and growing momentum for GEA reform, the demand for and investments in large-scale high profile assessments remains significant; with strong signals for enhanced international political support for existing of processes and the creation and widespread support for new platforms, institutions, and scientific panels;

3. Contemporary assessments are undergoing a transformational shift from predominantly problem-based knowledge syntheses, towards solution-oriented enterprises;

4. There is a critical mismatch between the emerging solution-oriented ambitions (objectives) of contemporary GEAs and the available means in terms of conceptual frameworks, methodologies, necessary expertise, and resources;

5. Future assessment design must become more reflexive to the institutional architecture characterizing IEG and the broader political context in which GEAs are situated.

2.1 Introduction

It's been nearly 40 years since the first large-scale scientific assessment of both global and environmental scope was initiated: the OECD Assessment of Long-Range Transport of Air Pollutants (LRTAP). Here, we define such global environmental assessments (GEAs) as highly participatory and deliberative social processes for assembling, synthesizing, interpreting and organizing existing scientific knowledge on complex environmental issues with a view towards informing public policy and various decision-making structures. Over the years, the practice of conducting GEAs as an iterative social-learning exercise has given rise to various structural and normative obstacles. Among the most universal, and perhaps the most divisive challenge, is how to accommodate and objectively represent the vast array of perspectives and the diverging and sometimes conflicting interests that actors bring to the table (Toth, 2003). Despite such obstacles and the fact that no perfect analogues exist, GEAs have been viewed by many to be very useful and deeply influential tools, not least for catalyzing cooperation and arriving at consensual evidence-based knowledge on pervasive trans-boundary environmental problems (Mitchell *et al.*, 2006; Rothman *et al.*, 2009; Watson, 2013). Arguably, they remain among the most elaborated, systematic and comprehensive science-policy structure ever developed.

Nevertheless, GEAs have shared a complex and uneasy coexistence with international policy-making systems and governance regimes, where scientific debates and political ones, not surprisingly, often overlap and clash. Amidst the rapidly changing political and institutional contexts, high-stakes international environmental governance issues, rising epistemic complexity and broadening knowledge needs, the GEA enterprise now finds itself at crossroads. A growing numbers of stakeholders at the science-policy interface, and even within the GEA community, are calling for reforms and questioning whether existing GEA modalities remain fit for purpose.

Four decades offers a good vantage point to reflect on the evolving character, dominant focus and shifting political and institutional orientation of scientific assessments. The purpose of this chapter is to provide a retrospective analysis of the GEA landscape and the changing character, orientation and dominant focus of contemporary assessments. We examine how and why elements of organizational design, objectives, means, as well as the evolving political backdrop depend on one another. Building a deeper understanding of potential interdependencies, we believe, can help address critical gaps in practical and empirical knowledge about the increasingly complex web of factors that exert influence over the function and perceived utility of GEAs; with a view of informing future processes and more immediately, the sixth iteration of UNEP's recurring flagship assessment: *Global Environment Outlook* (GEO-6).

The following analysis is set in the wider context of the international agenda on sustainability and the governance system for the global commons, where the environment is increasingly recognized as an equal and indispensable dimension of sustainable development. Most notably, this is being manifested in the ongoing intergovernmental deliberations and negotiations currently taking place on sustainable development goals (SDGs). This thinking is a significant departure from the dominant international discourse of the mid 1970s when GEAs were conceived. It is within this emerging narrative, and the dynamically changing political context that GEAs are embedded in, we argue, that contemporary assessments are experiencing a transformational shift and reorientation toward to solution-oriented enterprises.

2.2 Rationale and analytical framework

Most of the reflective scholarship on Global Environmental Assessments[1] (GEAs) and the efficacy of their impacts in particular, have focused on studying the different means of conduct and processes through which GEA-knowledge and information enters and influences, or fails to influence, decision-making spheres (i.e., domestic or foreign public policy and international governance). In other words, 'why', 'how' and 'when' have GEAs led to the adoption of political and economic choices, and/or changes in societal behavior that would not otherwise have occurred.

Obviously these questions remain crucial areas of investigation. However, we believe that they represent only one side of a feedback loop. As such, we argue that any critical or systematic exploration of the relationships between assessment approaches and

[1] (e.g., Social Learning Group 2001a, 2001b; Farrell *et al.* 2001; Pinter 2002; Toth 2003; Jasanoff and Martello, 2004; Clark *et al.* 2005; Farrell and Jäger 2006; Mitchell *et al.* 2006; NRC 2007).

effectiveness cannot be separated from sociopolitical interests and the highly institutionalized circumstances in which assessment processes are embedded in, and shaped by. Thus, a key point of departure for this research rests on the assertion that understanding how the evolving political contexts (and international discourses) within decision-making spheres are influencing GEA processes themselves, constitutes an equally important yet scarcely studied dimension of this so-called assessment feedback loop.

Building on the seminal body of GEA research that emerged in the early 2000s—pioneered by the *Social Learning Group* and the *Harvard Project,* as previously described—this work goes a step further to examine how and why elements of organizational design, objectives, means, and the evolving political backdrop depend on one another. Moreover, the analysis presented in this chapter seeks to build an improved empirical understanding of potential interdependencies and misalignments between these co-evolving and dynamically shifting political contexts, objectives and means. This knowledge, we believe, can unlock important insights about the increasingly complex web of factors influencing the function and perceived utility (consequences considered beneficial) of GEAs. And ultimately, could help to inform strategic aspects of future assessment-making including the sixth iteration of UNEP's flagship *Global Environment Outlook (GEO)* series: GEO-6.

As discussed in Chapter One, the analytical framework used to structure our overall analysis and investigation into the strategic aspects of assessment-making vis-à-vis the principal mediating variable *political context*; includes three categories of other dependent variables: *objectives*, *means* and *consequences*. Here, we attempt to elaborate key aspects of the OMC framework by proposing a stylized, conceptual model that we call the 'co-evolution framework' (**Figure 2.2.1**). This

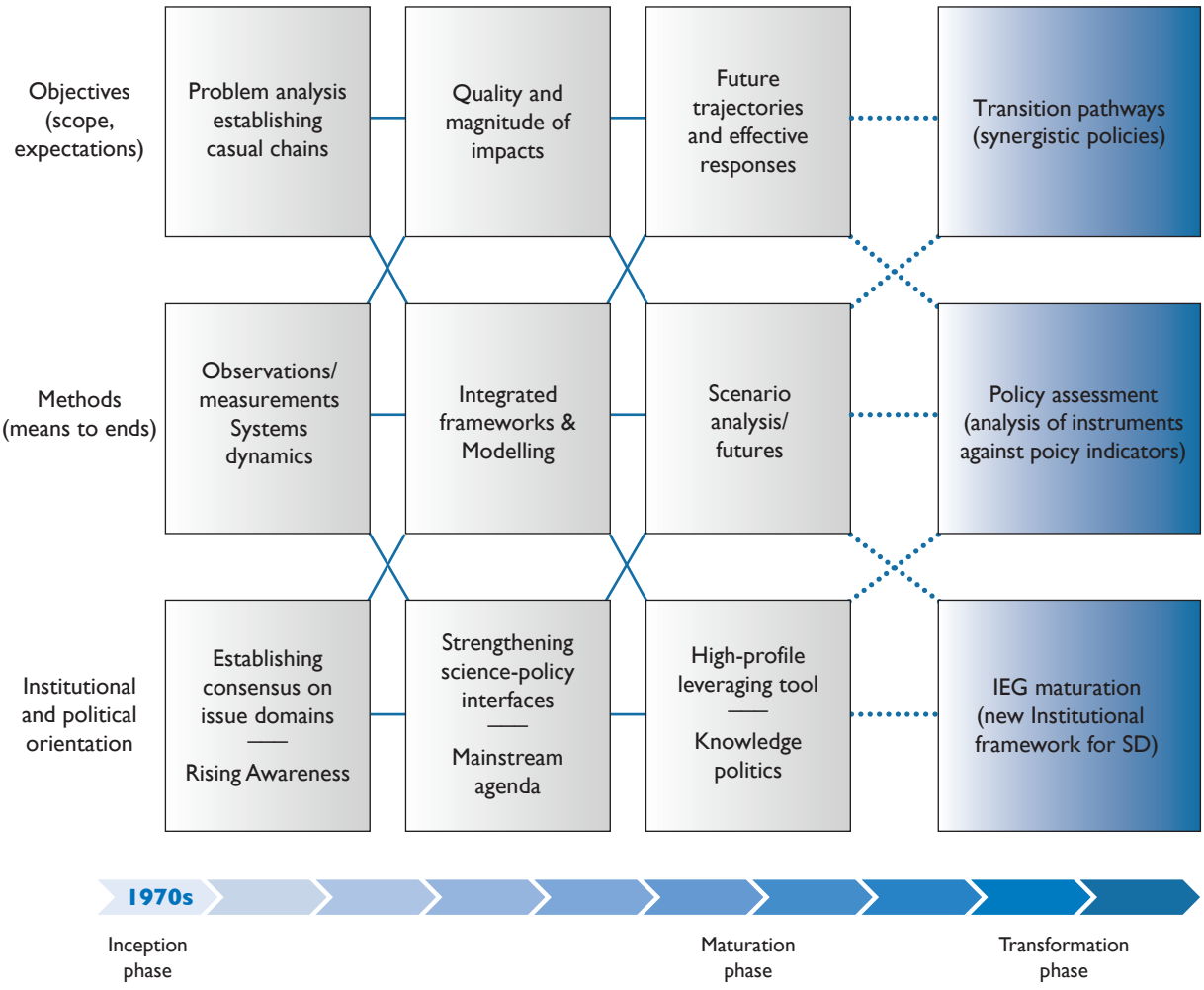

Figure 2.2.1. – A conceptual framework of the dynamic co-evolution of assessment objectives, methods and political context

simplified framework has helped to organize and frame our analysis of the potential interdependencies and misalignments mentioned above. Moreover, it carries forward the notion of interdependency between assessment design and political context, and attempts to embed three specific hypotheses examined in this study. The first postulates that over the last two decades, and particularly in recent years, GEAs have had to contend with a significant rise in both epistemic and process complexity. This thesis further translates into the supplementary hypothesis that considerably more is being demanded of and expected from GEAs today, as compared with first-generation assessment processes. The second hypothesis predicts that there is a critical and widening incongruence between the emerging ambitions (objectives) of contemporary GEAs and the available means through which to effectually carry out assessment processes while realizing the full scope of their aims, and by that virtue, satisfying the multiplicity of stakeholder expectations. Here, the analysis puts emphasis on *GEA means* in terms of conceptual frameworks, methodologies, resources and expertise. Finally, the third and perhaps most important hypothesis, predicts that contemporary assessments are undergoing a transformational shift, from predominantly problem-based knowledge syntheses, towards solution-oriented enterprises. Each of the hypotheses was informed by previous scholarship, careful document review and previous direct experience with the UNEP-led GEO process.

The proposed conceptual framework as presented below consists of three parallel evolutionary pathways for *objectives, methods*, and *political/institutional orientation*. The conceptual figure attempts to map out successive changes in the prevailing focus of each pathway over time. The horizon distinguishes three phases: inception, maturation and transformation, with the latter phase roughly representing the present. However, these phases are conceptualized as parts of a continuum rather than as mutually exclusive or categorical domains. While acknowledging the obvious limitations with this somewhat generalized and coarsely aggregated visualization, it is not intended to be faithful representation of all GEA processes, but rather it serves as a framing tool for examining our three interrelated hypotheses, and the backdrop of our discussion.

2.3 Methodological approach

The methodological approach employed for this research finds its rigor through corroboration by multiple lines of evidence derived from in-depth interviews, a two-day experts' workshop, systematic literature and document review, direct experience with global assessment processes, and a comparative meta-analysis of selected Global Environmental Assessments (GEAs) spanning the period of 1977 to 2014. As mentioned in the introduction, a GEA metadata catalogue comprising of information across 20 large-scale assessments (**Table 2.3.1**) was developed as a core component of this research and forms a significant part of the empirical data underpinning our retrospective analysis here. The main purpose of the catalogue was to facilitate the comparative analysis of key attributes and epistemic properties—basic as they may be—across a range of representative assessment processes and subsequent GEA publications occurring over the last four decades.

While there were no strict criteria or prescribed screening process for the selection of the 20 GEAs, the decision to include a given assessment in the catalogue was essentially influenced by three fundamental considerations: (1) a strive to achieve a representative sample of assessments including a mix of recurring and non-recurring processes; (2) sufficient access to information regarding relevant preparatory and background documentation (i.e., authorizing mandates, participants lists, operating budgets etc.); and (3) large-scale assessments that were 'global' in their scope both in terms of domain coverage and participation.

A broad range of documents was analyzed as part of the data-gathering exercise for developing this catalogue. They include background documents, scoping papers, meeting reports, independent evaluations, official United Nations documentation (e.g., resolutions of the UN General Assembly, decisions from UN Governing Bodies, official UN information documents in support of inter-governmental meetings etc.), government reports, news articles, peer-reviewed papers, and of course, the assessment publications themselves. The development of the catalogue, which was initiated in March 2013, involved collecting, collating, synthesizing and coding information, and, where necessary, digitizing selected texts from earlier GEAs (e.g., key messages, assessment objectives etc.) to facilitate comparative discourse analysis. The selection of attributes and the information categories included in the catalogue was informed by several discussions within the FOGEAM research group, various GEA practitioners, as well as the outcomes of a two-day experts' workshop reflecting on the experiences of GEO-5. A complete list of attributes along with their

specific selection criteria, as well as the structural and methodological details of the catalogue, including descriptions and definitional characteristics is described in a separate annex to this report (see Annex E).

While the data used in the analysis is based on a wider of sample of GEAs, the research uses GEO-5 as an exploratory case study, and thus, draws heavily on information, critical reflections, and experiences from the GEO process. These data were derived from extensive document review, the authors' direct experiences with GEO-5, and 80 in-depth semi-structured interviews conducted between August 2013 and June 2014, one year following the release of GEO-5.

The interviews were carried out with a broad spectrum of GEO-5 stakeholders including, authors, expert contributors, reviewers, governmental representatives, secretariat staff involved in the production of the assessment, and members of the target audience. Interviews were digitally recorded, with the consent of each interviewee, and transcribed and coded using Max-QDA.

Table 2.3.1. – Global Environmental Assessments included the GEA-data catalogue

	Assessment title (abbreviation)	Completion year	Lead organization
1.	Assessment of Long-Range Transport of Air Pollutants: Measurements and Findings (*LRTAP*)	1977	OEC
2.	Atmospheric Ozone Assessment (*AOA*)	1985*	NASA & WMO
3.	Scientific Assessment of Stratospheric Ozone (*SASO*)	1989§	WMO
4.	Intergovernmental Panel on Climate Change First Assessment Report (*IPCC FAR*)	1990§*	IPCC
5.	Global Biodiversity Assessment (*GBA*)	1995	UNEP
6.	Intergovernmental Panel on Climate Change Second Assessment Report (*IPCC- SAR*)	1995*§	IPCC
7.	Global Environment Outlook (*GEO*)	1997§	UNEP
8.	Scientific Assessment of Ozone Depletion (*SAOD*)	1998	WMO, UNEP & NASA
9.	Global Environment Outlook (*GEO-2*)	2000§	UNEP
10.	Intergovernmental Panel on Climate Change Third Assessment Report (*IPCC TAR*)	2001§*	IPCC
11.	Global Biodiversity Outlook (*GBO*)	2001§	SCBD
12.	Global Environment Outlook (*GEO-3*)	2002§	UNEP
13.	Global Biodiversity Outlook (*GBO 2*)	2004§	SCBD
14.	Millennium Ecosystem Assessment (*MA*)	2005*	UNEP
15.	Intergovernmental Panel on Climate Change Fourth Assessment Report (*IPCC- AR4*)	2007§*	IPCC
16.	Global Environment Outlook (*GEO-4*)	2007§	UNEP
17.	International Assessment of Agricultural Science and Technology for Development (*IAASTD*)	2008	World Bank, UNEP & FAO
18.	Global Biodiversity Outlook (*GBO 3*)	2010§	SCBD
19.	Global Environment Outlook (*GEO-5*)	2012§	UNEP
20.	Intergovernmental Panel on Climate Change (*IPCC- AR5*)	2014§*	IPCC

*§ Recurring assessments; *assessments containing two or more separate volumes*

2.4 Tracing the origins and early development of GEAs

Scholarship on the sociology and philosophy of science has shown that the scientific enterprise is not without flaws, or contested boundaries. A breadth of recent sociological studies of science, for example, have done much to illuminate that even the most rigorous scientific research is not impervious to value-laden activity (e.g., Rouse, 1987; Yearley, 1988; Allchin, 1998; Longino, 1990; Lederman and Tobin, 2002; Weinberg, 2003; Jasanoff, 2004). As members of society, scientists bring with them a range of inherent values, experiences, assumptions and expectations that ultimately shape the questions they decide to pursue, the methods they choose to apply, and the systems through which they acquire, interpret and transmit their data and knowledge (Smith and Freeman, 2014).

While such debates regarding the objectivity and epistemic integrity of science have varied over time, they are by no means new. Nevertheless, the value of reliable scientific knowledge for informing public discourse and societal choices, at least in principle, has remained mostly undisputed. This is increasingly so in the domains of human health, problems related to global environmental change, and other issues deemed to directly affect our quality of life. Knowledge-based societies and decision making structures, therefore, have consistently turned to empirical research and the scientific community to provide the closest approximations of 'proof' about whether a particular problem in the natural world exists or could pose harm, and if so, how best to respond (Oreskes, 2004; Oreskes and Conway, 2010).

But beyond the utility and overall impact of science on modern society, which has seldom been contested, much less universal is the manner in which science, and its epistemic communities, is organized to influence policy decisions. For decades, the disputed role and authority of science as an impartial arbiter, particularly in ideologically polarized policy arenas, has given rise to extensive debates regarding the limitations of scientific autonomy (i.e., detached from society) and the cultural misappropriations of science. Gauchat (2012) suggests that the structures through which scientific advice is constituted and assigned authority in decision-making spheres, is linked to cultural perceptions about its political neutrality. Gibbons (1999) and Lubchenco (1998) describe the emergence of a new social contract between science and society, which while adhering to conventional norms for validating science's reliability, also reflects the increasing complexity of modernity and thus is more sensitive to a broader range of social implications. For Jasanoff (2004) science and society cannot be separated. Instead she argues that the activities of science and technology "cease to be a thing apart from other forms of social activity, but are integrated instead as indispensable elements in the process of societal evolution. Science, made social in this way, can be compared and contrasted with other exercises in the production of power. Increasingly, the realities of human experience emerge as the joint achievements of scientific, technical and social enterprise: science and society, in a word, are co-produced, each underwriting the other's existence" (Jasanoff, 2004:17).

Ultimately, notions of how to construct and navigate the crucial interfaces between science, policy, and civil society remain deeply contested. The difficult relationship and demarcation between science and policy, including modalities for cooperation and the transmission of reliable scientific knowledge and information across these domains has proven increasingly complex and politically divisive for controversial environmental issues and the management of the global commons. A number of researchers have called attention to certain mutual dependencies between, and encroachments on, the allegedly isolated spheres of science and policy, resulting in tendencies for the politicization of sciences and scientification of politics (e.g., Haberer, 1972; Funtowicz and Ravetz, 1991; Gieryn, 1999; Hellstrom and Jacob 2000; Hisschemöller *et al.* 2001; Frickel and Moore, 2005; Leiserowitz *et al.* 2011; Gauchat, 2012; Hoppe *et al.*, 2013; Wesselink *et al.,* 2013). More specifically, researchers have documented several contexts and explicit cases (mainly in areas related to environment and public health) where scientific information is either deliberatively misused or where scientific processes are subverted to serve political goals. Some of the most distressing examples include efforts to suppress or distort scientific findings through senior appointments of researchers who meet certain political or ideological criteria; financing politically self-serving scientific research; and targeted efforts to intimidate and undermine individual scientists, as recently witnessed in the climate science community (Dryzek, 1994; Mann, 2012; *others*).

Jasanoff (2004) describes a crucial turning point in the relationship between institutions of science and public policy or government, more broadly, that signaled an end to 'an age of innocence' lasting until the 1960s, where scientists and decision makers

shared a more linear, straight-forward partnership, with delineated responsibilities for shaping societal responses. This transition coincided with a discernible rise in consciousness about large-scale environmental phenomena (e.g., stratospheric ozone depletion, climate change, persistent organic pollutants) and the collective imperative for society to comprehend the consequences and potential threats to human wellbeing.

In part, this shift was attributable to a series of highly publicized, landmark studies over a relatively short period of time—beginning with the release of Rachel Carson's groundbreaking book *Silent Spring*—exposing the dangers and global interconnectedness of various pervasive environmental problems. In addition to Carson's (1962) revelations on the indiscriminate use of synthetic chemical pesticides including DDT, these successive studies also included: *The Population Bomb* describing ecological threats of a rapidly growing human population (Ehrlich, 1968), the discovery of widespread presence of CFCs in the atmosphere (Lovelock, 1970), and the team of Swedish researchers whose work provided the first compelling substantiation of the harmful effects and trans-boundary nature of the acid rain phenomenon (Odén *et al*., 1969).

Together, these scientific milestones, each of which made their way to the verge of the mainstream, amplified the direness of environmental hazards facing the world and offered perhaps the first sobering picture of society's susceptibility to these problems. The events would also become a precursor to the inaugural Earth Day (April 22, 1970), capitalizing the emerging consciousness about environmental abuses and channeling its energy to mobilize mass support. The juxtaposition of the Earth Day campaigns that ensued across much of Europe and the United States (including the largest protests ever held in American history with an estimated 20 million demonstrators) and the collective international political push to put the environment on the center stage, according to many scholars, was no accident (Rogers, 1990; Hayes, 1995; Cahn and Brien, 1996; Speth, 2002; Ivanova, 2007; Webber, 2008; Graham, 2010). Over the next few years, the creation of several prominent international treaties and domestic environmental laws in industrialized nations, along with the pressures of a continuing social movement–reinforced by the scientific community—catalyzed widespread recognition for coordinated international cooperation and the need to create a permanent intergovernmental architecture for addressing global environmental problems (Desai, 2002; Ivanova, 2007). By the close of 1972, the United Nations Environmental Programme (UNEP) was established. Symbolically, UNEP was seen to represent the world's "ecological conscience" (US Congress, 1973). More practically, it was mandated to facilitate the impartial monitoring, reporting and ongoing assessment of the state of the global environment.

This new era of environmental multilateralism would soon trigger a proliferation of international treaties, agreements, regimes and science-policy processes (Desai, 2010; Jabbour *et al*., 2012). But first, the international community and the still embryonic IEG enterprise would need to evolve a systematic process that could at once harness an international scientific consensus and transcend divergent national allegiances. Accordingly, various international scientific panels, expert advisory bodies and other similar independent structures began to coalesce around most multilateral environmental processes. Putting in place such structures to analyze, evaluate and deliver informed collective judgments about the impacts of pervasive environmental problems and the effectiveness and consequences of remedial action (or inaction) became a precondition for negotiating multilateral political responses (Morrisette, 1989; Agarwala, 1999; Selin and Eckley, 2003; Grainger, 2009). These efforts to invoke and mobilize an accepted common body of scientific knowledge on complex environmental issues to support the legitimatization, and eventual edifice of specific international regimes, we believe, marked the birth of one of the most remarkable social innovations from within the scientific enterprise: *international scientific knowledge assessments*.

The Montreal Protocol would eventually institutionalize the concept of *scientific assessments* by enshrining a mechanism to establish an independent international group of experts to periodically assess relevant scientific developments and guide policy negotiators in the implementation and revision of the treaty (Benedick, 2005). By the late-1980s, coordinated assessments involving extensive collaborations between large numbers of scientists from many nationalities and other stakeholders became a driving force behind international policymaking. In effect, these highly structured communication processes or social endeavors—beyond the reports they produced—represented an important intermediary in the science-policy spectrum (Farrell and Jäger, 2006). Moreover, early scientific assessments are seen to have helped forge a new intergovernmental cooperation and objectively defensible means to arrive at consensus on environmental issues and policy positions that

seemed irreconcilable (Mitchell *et al*., 2005). Over the next decade, various large-scale assessment processes, most notably the IPCC, would evolve and codify a deliberative consensus-based approach to knowledge production (Weingart, 1999; Goodwin, 2009; Curry and Webster, 2013).

By the early-1990s, there was widespread recognition by the international community that the vast majority of environmental issues extended beyond strict geopolitical confines, and could not be analyzed or resolved in isolation. This gave way to new levels of international dialogue and cooperation, including new participatory roles for international institutions and NGOs, towards the production of consensual scientific knowledge on complex matters related to environmental sustainability, particularly global biodiversity and climate change (Schmidheiny, 1992; Raustiala 1997; Watson, 2005).

The rise in awareness and political attention on the issue of sustainable development that catalyzed the 1992 Earth Summit in Rio de Janeiro, and the aftereffect of this watershed intergovernmental event, sparked a burst of IEG attention and activity. The focus of the 1992 Summit was the deteriorating state of the global environment and the relationship between economics, science and the environment in a political context. One of the key outcomes was a non-binding, voluntarily implemented action plan: *Agenda 21*, which among other things, reinforced the importance of monitoring, assessments, and technology transfer.

Its been suggested, that together with the renewed vision for multilateralism that followed the end of the Cold War, the 1992 Rio Earth Summit was an important causal force behind a ten-year surge in multilateral treaties (**Figure 2.4.1**) and other parallel governance structures that emerged from 1992 to 2002 (Desai, 2003; Elsig *et al*., 2011). The Summit signaled a renewed commitment to promote international treaties as a central vehicle for international cooperation on sustainable development and the environment. But it also brought to light a number of critical implementation challenges for IEG including, uncertainties in related scientific knowledge and the need to neutralize North-South information asymmetries (*reference*). Hence, in addition to a rapid succession of multilateral environmental agreements (MEAs) in the post-Rio period, came increasing appeals from the international science-policy community to redress ongoing deficits of reliable scientific and technical information to support these agreements (Haas *et al.,* 1992). Interestingly, as seen **Figure 2.4.1** we can observe a significant positive relationship in the cumulative increase and distribution of MEAs and GEAs beginning in 1990s and lasting until approximately 2005, when the expansion of MEAs effectively reached a plateau, and conversely, the occurrence of GEAs has since exploded. Potential explanations for this apparent decoupling and possible dissociation of GEAs from multilateral treaties are discussed in the later sections of this chapter.

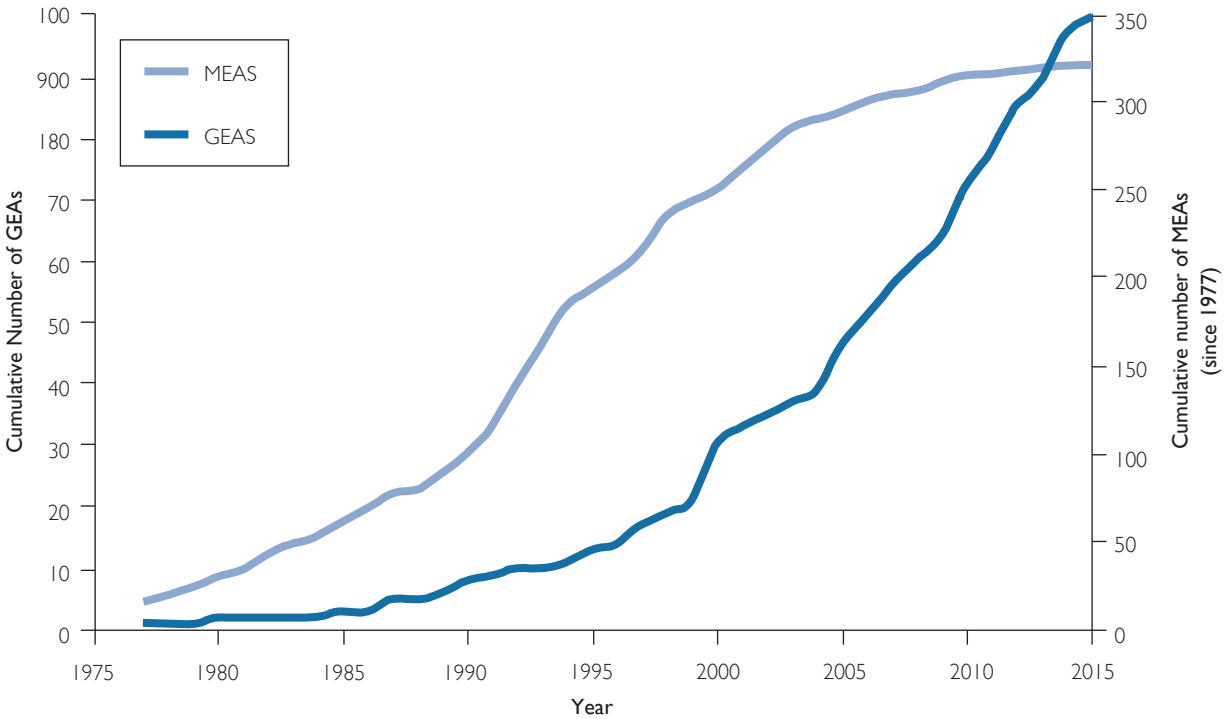

Figure 2.4.1. – Correlation in the growth of MEAs and GEAs from the early 1990s until around 2005

2.5 Shifting political and institutional orientations

> *"While environment helped drive the process of democratization even 25 years ago, today, democratic institutions, such as better access to information, environmental assessments and accountability mechanisms, are the drivers of a growing sustainability movement"*
>
> *(Lintner, May 2014)*

Much has changed since the mid-1970s when Global Environmental Assessments (GEAs) were conceived, not least with the broader geopolitical setting and the institutional architecture and agenda for international environmental governance (IEG). At present, the environment represents the second most common area of international rulemaking, only after international trade (Muñoz *et al.,* 2009). Moreover, the dominant international discourse has clearly shifted away from the environment being treated as a 'niche' topic, and instead, increasingly recognized as an equal and indispensable dimension of sustainable development.

Zaccai (2012) describes a series of changes in the constellation of actors, discourses, modes of action, and the nature of problems themselves, which have characterized the evolution of the "environmental scene" and to a large extent, shaped the discursive struggle over sustainable development. Building on his analysis, **Table 2.5.1** enumerates an expanded selection of features and iconic issues relevant to the evolving international environmental scene contrasting the pre-sustainable development era (1970s and 1980s) with the current situation (defined as the last ten years). These prevailing shifts offer insightful perspectives for examining how GEAs have been influenced by and responded to the wider context in which these have transformations occurred.

Table 2.5.1. – Figurative representation for the evolution of the environmental scene

Selected features of the environmental scene	Pre-sustainable development era (1970s and 1980)	Current situation (last ten years)
1. Iconic policy instruments	Command & control instruments (e.g., *LRTAP and Montreal Protocol*)	Economic/ market-based instruments (*e.g., 2015 climate change agreement*)
2. Key actor(s) relied on	Predominantly Government (heavy reliance on public sector)	Mix of government & stakeholders (*weakening public sector; growing role for non-government actors*)
3. Dominant modalities of action/ implementation	Emphasis on industrial sectors; technology-driven interventions (e.g., *agricultural intensification*)	Working with industry & consumers, through technology, innovation, economy & finance (e.g., *REDD*)
4. Knowledge about the Environment	Superficial, or limited to specialists in a narrower range of fields	Extensive, mainstreamed, diffused in many realms of society
5. Information, data and knowledge management	Limited public access, expensive, poor/ inadequate national data flows (*highly proprietary*)	Proliferation of digital, open access data platforms and networks; (*common wealth of knowledge*)
6. Main disciplines; fields of scientific engagement	Predominantly natural science researchers; observational sciences (*chemistry, biology & physics*)	Trans-disciplinary research; integrated approaches; projections & futures (*social, natural, economic & holistic*)
7. Iconic environmental problems; most urgent	Wastes, water pollution (*easier to define/ narrower point sources*)	Climate change, loss of biodiversity (*more complex & diffuse*)
8. Main actors/regions seen to be drivers of adverse change	Industries, production patters OECD (*United States*)	Consumers, consumption patters Emerging economies (*China*)
9. Social equity issues and environmental equality	Superficial, or neglected concerns (*peripheral to mainstream debate*)	Key goal of many environmental policies (*core concept for SDGs*)

Source: Adapted from Zaccai (2012)

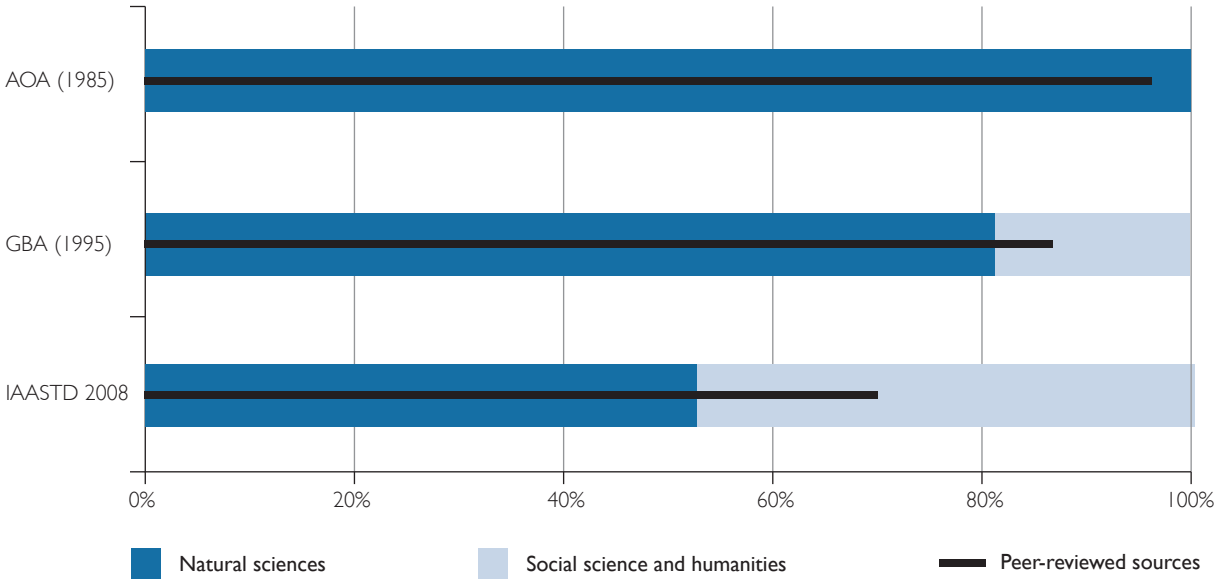

Figure 2.5.1 – Proportion of source materials (n=80) drawn from natural science research vs. social sciences, including the humanities (e.g., economics, political science, sociology, law etc.)

For example, a discernable broadening of thematic scope becomes evident (see **Figure 2.5.1**) if one compares earlier assessments (e.g., 1977 LRTAP or Atmospheric Ozone, 1985) that dealt with more narrowly defined and concentrated environmental problems, compared with recent GEAs (e.g., the fifth IPCC report, 2008 IAASTD or GEO-5) that encompass much more diffuse and interrelated issues. It is not surprising therefore that today's most challenging and pressing issues on the IEG agenda are problems characterized by highly dynamic patterns of causality and complex interactions between environmental drivers and pressures (Jabbour *et al.,* 2012, 2014).

Relatedly, significant changes in the composition of experts (disciplinary backgrounds) involved in GEAs and the underlying research focus (knowledge sources) that assessments are derived from have also occurred. Both of these aspects have shifted from being driven predominantly by the natural sciences to increasingly being informed by trans-disciplinary studies. Results from our meta-analysis are illustrative of this trend, where citation analysis of 240 randomly selected abstracts (or summaries) from source materials of three assessments (*n=80* for each GEA) reveal a decreasing reliance on information drawn from the natural sciences: 100% for the 1985 Ozone Assessment, 84% for the 1995 GBA, and 53% for the 2008 IAASTD (**Figure 2.5.1**).

Regarding the roles of key actors and dominant modalities for action in the evolution of the environmental scene, the emphasis has shifted away from public-sector reliance, towards multi-stakeholder engagement, shared responsibility and collaborative private-public actions (Börzel and Risse, 2005; Glasbergen *et al.*, 2007; EC 2010; Lozano, 2012). This shift parallels the broader emerging transformation occurring at the science-policy interface regarding the move towards deliberately inclusive knowledge systems, and efforts that recognize the need to transcend traditional reductionist approaches and embrace collaborative knowledge generation (Vogel *et al.,* 2007; Bammer, 2008; Huitema and Turnhoutb, 2009; Wesselink *et al.,* 2013).

This thinking has influenced the direction of the newly established Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which intends to conduct its future assessment processes through more open systems of knowledge production (UNEP 2009; Perrings *et al.*, 2011). To this effect, IPBES has recently developed a series of procedures which essentially institutionalize their commitment to engage more closely with the policy community and to work with different knowledge systems (IPBES 2013; Thaman *et al.*, 2013).

Many of these transformations reflected in **Table 2.5.1** are also manifesting in the international discourse on the post-2015 development agenda, and the ongoing intergovernmental process to develop a set of 'action-oriented' sustainable development goals (SGDs) to replace the current millennium development goals

(MDGs) set to expire in 2015. For example, the emerging SDG framework, intended to help drive the implementation of sustainable development, promises to reflect a much more balanced and integrated treatment of the global environment and the imperative to address both social and environmental inequalities. In addition to preventing environmental problems, the emerging framework places greater importance on the need to promote equitable access to increasingly scarce resources and energy, and to minimize the vulnerability of the poor. In this regard, debates have centered on how existing international agreements can address equitable, inclusive low-carbon growth. A similar discourse-shift is reflected in the narratives of many recent GEAs that call attention to the now widely recognized notion that the science of global environmental change can no longer be divorced from fundamental issues of fairness, equity and social justice (e.g., TEEB, 2010; Green Economy, 2011; GEO-5, 2012; IPCC, 2014).

Another important difference between the creation of the MDGs and the current SDG process–bearing witness to the radical geopolitical transformation and the evolution of the environmental scene—is the fact that primarily southern (lower-income) countries created the impetus and have been driving the development of the SDGs. The increased involvement of emerging economies and key middle-income countries, in particular, has resulted in a framework that better reflects the principles of universality and accountability, while still respecting the need to foster mechanisms for adaptability. This is a drastic shift from the pre-sustainable development era, and even the 1990s, when northern economies dominated most multilateral fora including IEG, while low and middle-income states (i.e., G-77) and the so-called BRICs (Brazil, Russia, India and China) had much less political, economic and scientific clout (Papa and Gleason, 2012).

Similarly, the frontiers of innovation are shifting from northwest to southeast, while international investments in technology and scientific research in the global south are accelerating at a rapid pace. It comes as little surprise therefore to discover that developing-country participation rates in GEAs have experienced a staggering 10-fold increase from 1977 to 2014 (**Figure 2.5.2**). The enhanced involvement and greater influence that middle and low-income countries have found themselves with for the SDG process, as a result, could mean more legitimacy and impact for the new set of development goals. In principle, the same could hold true for the future production and uptake of GEA findings—and particularly in countries facing severe knowledge deficits, low scientific capacity and limited data flows.

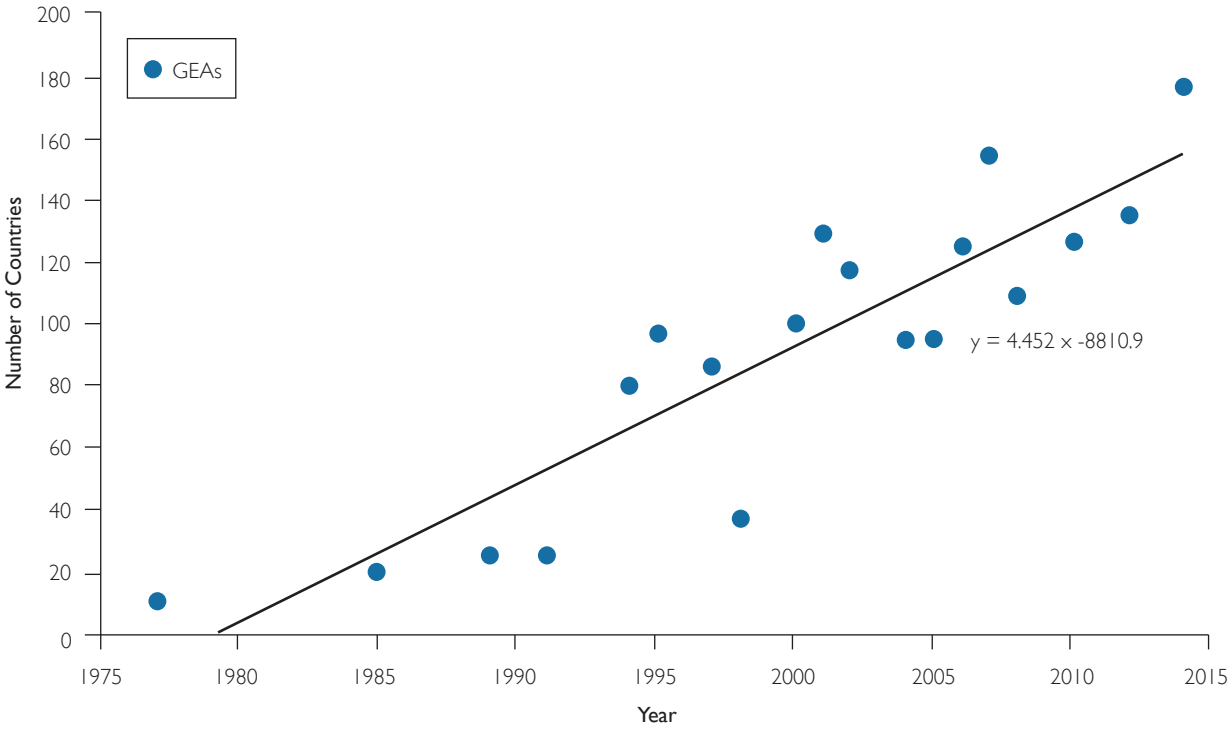

Figure 2.5.2. - Country-level representation in GEA processes spanning 1977 to 2014

There is little doubt that the political and institutional orientation in global affairs has shifted toward giving greater prominence to environmental issues, and significantly so in recent years. As evidenced in the SDG negotiations, the prominence of environmental pressures and resource scarcity above any other factor are shaping the post-2015 development agenda. This represents a fundamental change in course from the late 1990s when MDGs were being negotiated (Hulme, 2009), and key GEAs were gaining traction (Ivanova, 2005; Mitchell *et al*., 2006).

Another clear signal of the preeminence of the environmental agenda is the recent institutional strengthening and upgrading of UNEP, following the call by Heads of States and Governments at the close of the Rio+20 summit; and later endorsed by the UN General Assembly at the 67th session in 2013. This watershed decision affords UNEP universal membership of its governing body and enables access to more predictable, stable and increased funding from the UN Regular Budget. It also signals the increasing confidence in the ability and role of the organization to deliver support to the sustainable development agenda, in part through its assessment activities that were recognized favorably (United Nations 2012; Ivanova, 2013; Rangreji, 2013). For example, paragraphs *90* and *88(d)* of the Rio+20 Outcome Document "The future we want" call on member states to:

> *"promote a strong science-policy interface, building on existing international instruments, assessments, panels and information networks, including the Global Environment Outlook, as one of the processes aimed at bringing together information and assessment to support informed decision-making"*…and further emphasizes the imperative *"for the continuation of a regular review of the state of the Earth's changing environment and its impact on human well-being, and in this regard we welcome such initiatives as the Global Environment Outlook process"*
>
> *(UN Resolution A/RES/66/288, September 2012)*

In spite of the preeminent status that the environmental agenda has acquired, the current system of international environmental governance (IEG) continues to be characterized by a fragmentation of institutions, governance regimes, epistemic communities, and scientific assessments (Oberthür, 2009). While important advances in bringing international treaties and related aspects of IEG into a more coherent and stable institutional framework have taken place (Dedasi, 2003), the constellation of MEAs—which together forms the overarching international legal basis for cooperation on environmental protection—has steadily become too complex and disconnected from GEA processes (Watson, 2005; Mee, 2005; Clark *et al*., 2006; Rothman *et al*., 2009). The historical function and objectives of first-generation GEAs (those occurring before 1990) were comparatively narrower in scope (see **Figure 2.6.5**) and thus, could uphold a stronger coupling with existing legitimate and policy-relevant structures or specific international regimes, either in the making or on the horizon (Watson, 2005).

Selin and Eckly (2003) show that the international scientific assessments on persistent organic pollutants (POPs) from the mid-1980s, possessed much more fluid boundaries between science and policy domains and were directed at a "specific context of policy application, with mutual construction and evolution of scientific and policy agendas" (2003:21). Consequently, these first-generation GEAs, which they describe as expressions of 'regulatory science' played a prominent role in establishing POPs as an issue of international concern, setting agendas, influencing intergovernmental deliberations and ultimately shaping domestic, regional and international policies on the management and mitigation of POPs.

In this view, early GEAs played a more explicit role in framing relevant environment issues and building the necessary consensual knowledge and international cooperation—at a time when the underlying problems and responses were uncertain and governments were understandably hesitant to undertake specific multilateral commitments (Jasanoff and Wynne, 1998).

This resonates with findings from our meta-analysis, which suggest that first-generation GEAs (including their findings and recommendations) exhibit a stronger or more acute interaction with, and influence on, specific IEG negotiations (**Table 2.5.2**). Of the 20 large-scale GEAs examined, with the exception of the Global Biodiversity Outlook, only four assessments, all occurring on or before 1990, were found to show a discernible alignment with one or more specific multilateral policy processes: agreements, protocols and outcomes.

Interestingly, several of our interview respondents faulted contemporary GEAs (including GEO-5) for overemphasizing sociopolitical neutrality and the

Table 2.5.2 - Alignment of specific multilateral processes and outcomes for 1st generation GEAs

GEA	Year	Multilateral process/ MEA	Description of alignment and specific impact with multilateral process
LRTAP	1977	CLRTAP, 1979; EMEP Protocol 1984	Helped delegitimize denials of the occurrence of trans-boundary pollution transport and achieve political consensus on CLRTAP.
Atmospheric Ozone	1985	Vienna Convention, 1985; Montreal Protocol, 1987	Confirmed that human activities represented a substantial threat to ozone; helped established CFC reduction guidelines.
Stratospheric Ozone	1989	Montreal Protocol, 1987; London adjustments, 1990	Informed legally binding reduction goals for the use of CFCs, the main chemical agents causing ozone depletion.
First IPCC Report	1990	UNFCCC, 1992	Catalyzed the intergovernmental decision making process serving as the basis and eventual signing of UNFCCC

need to build consensual knowledge around global aggregated impacts and responses, at the cost of compromising policy specificity. Related to this, a number of respondents also expressed concerns about GEA modalities for knowledge exchange. And more specifically, that existing approaches often tend to frame issues in less tractable ways and thereby produce narratives that are detached, more generalized and less conducive to action. As one respondent noted:

> *"you end up with an assessment that contains quite a lot of [information] that makes the whole thing feel slightly unapproachable…[policy-makers] are much more interested in their particular country, particular regional impacts… case studies that are really directly touching upon their issues and their area rather than a very general global picture."*
>
> *(Interview respondent, 2013)*

The question is how and why these misalignments between GEAs and the specific context of policy applications (e.g., environmental governance regimes and policy-relevant structures) came to be. We posit, that a partial explanation, explored in more detail in the following sections, is attributable to a dramatic rise in the semantic and epistemic complexity of GEAs, in parallel with a broadening of the GEA audience base and the subsequent shift away from problem-based investigations, largely detached from society.

2.6 The evolving character of GEAs

The character, dominant focus and orientation of global environmental assessments (GEAs) have shifted quite dramatically since their inception, and particularly in recent years. Knowledge producers, intermediaries and boundary institutions facilitating these highly complex deliberative social processes are now expected to address an ever-expanding and increasingly inter- and trans-disciplinary knowledge base, huge volumes of data and information, extraordinarily large numbers of participants who represent increasingly diverse and diffuse actor-groups (stakeholders), more varied spatial, time and institutional scales, and new dynamics between the scientific and policy enterprises.

To better understand the re-orientation of contemporary GEAs, and the possible misalignments described in the preceding section, we examine more closely, exactly what aspects have changed and how these changes have evolved in relation to the shifting international environmental scene and political context as discussed in Section 2.4.

The following sections present some essential findings largely derived from the compilation and analyses of our metadata catalogue that illustrate: (1) a discernable rise in epistemic, semantic and process complexity in contemporary assessments; and (2) evidence of a transformational shift, in both the demand for and production of GEAs, from predominantly problem-based knowledge syntheses, towards solution-oriented enterprises.

2.6.1 Rising epistemic and process complexity

Perhaps the most obvious and certainly the most visceral change in the character of GEAs over the last four decades is the sheer length (i.e., page and word counts) of underlying reports, and the

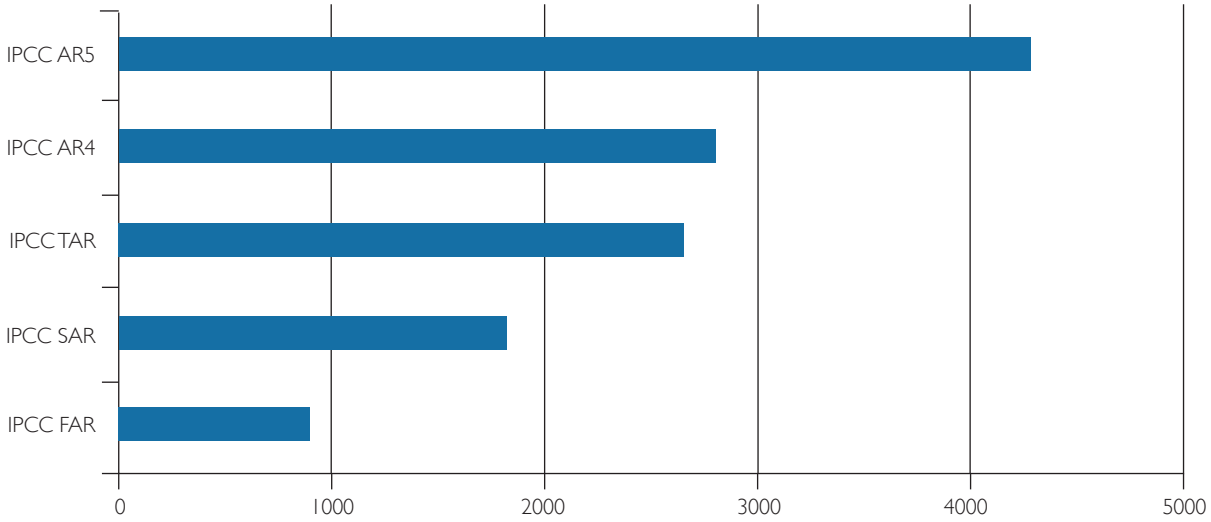

Figure 2.6.1. – Increasing length of successive iterations of IPCC underlying reports

expansive documentation and supporting material that is produced alongside these reports. Across all recurring and non-recurring processes examined, including the GEO series, GEAs have consistently produced increasingly voluminous reports. The most astounding results in this regard are the successive iterations of the high-profile IPCC assessment reports, which have experienced a nearly fivefold increase in length since their inception (**Figure 2.6.1**). The *Fifth* and latest underlying IPCC report totals over 4,300 pages across three volumes. This trend seems rather counterintuitive to the digital age of hyper-information, where the so-called *Internet revolution* is reshaping how information is delivered, accessed and consumed—and ultimately, creating audiences (across all segments of society) with shorter attention spans (Tapscott, 2008; Anderson and Rainie, 2012). It's not surprising therefore that the length and content-formats of contemporary GEAs, which many argue has reduced their accessibility to wider audiences, has been the subject of intense debate and criticism among practitioners and key GEA stakeholders (see Section 2.6).

Another clear trend contributing to the rise in process and semantic complexity of GEAs is the sharp increase in the number of participants actively engaged in producing a given assessment, along with a shift in the types of stakeholders and the distribution and weight of their respective roles. As illustrated in **Figure 2.6.2** the number of authors and 'expert' contributors has risen sharply over time for both the GEO and IPCC assessment processes, as well as six non-recurring GEAs spanning 1977 to 2014. In the case of the GEO series, this segment of GEA participants who are effectively responsible for content-development has gone from 186 individuals in the first GEO in 1997, to 863 in

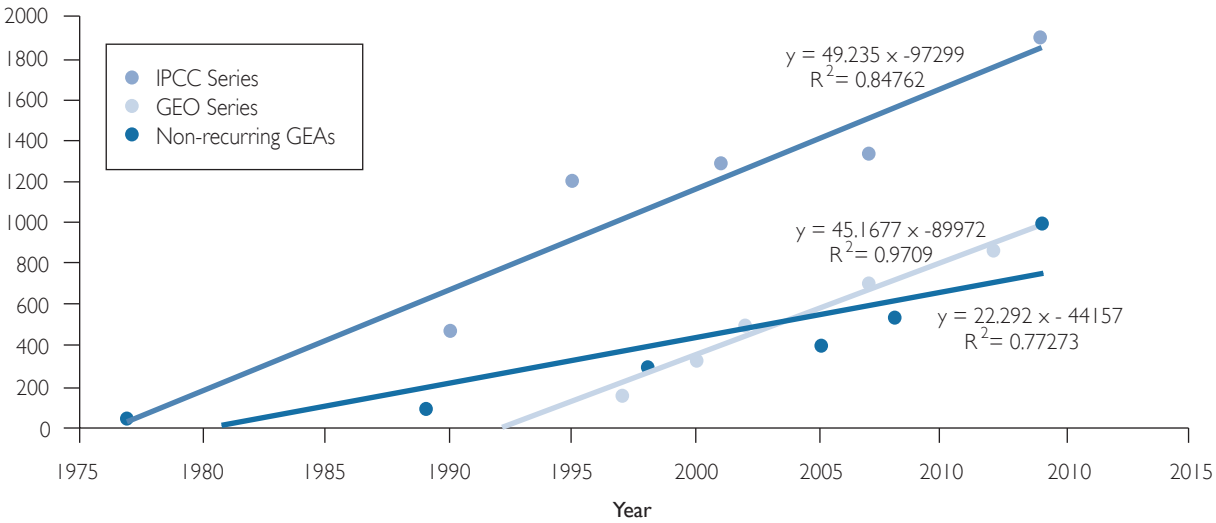

Figure 2.6.2. - Trends in the number of authors and expert contributors

GEO-5 in 2012. For the IPCC, a total of 607 authors and expert contributors were involved in delivering the first assessment report (FAR) in 1990, compared with 2,330 individuals for fifth IPCC assessment report (AR5) in 2013/2014. However, if one considers the full spectrum of stakeholders involved in the development and production of GEO-5 and AR5 (e.g., advisors, reviewers, government representatives, Secretariat production staff, editorial teams, technical support etc.) the estimated number of participants rises to a staggering 2,018 and 4,905 respectively. Considering that the first GEA (LRTAP, 1977) comprised of fewer than 80 individuals, contemporary GEAs have become enormously more complex and resource-intensive undertakings.

Challenges in understanding characteristics of complexity of interconnections (i.e., interpersonal, group and institutional dynamics) brought about by interfacing and facilitating thousands of actors towards a process of consensual (or negotiated) knowledge production, are both grossly underappreciated and quite frankly, remain poorly understood (Wesselink *et al.*, 2013). Moreover, heightened sensitivity to the concerns of political neutrality in contemporary GEAs, particularly in light of a shift toward solution-oriented analyses (see section 2.5.4), has increased the scope for divergent viewpoints (among and between different actors), and has complicated efforts to legitimately manage, and where necessary, mitigate such divergent viewpoints (see Chapters 4 and 5).

Despite the exponential rise in GEA participants and the related increase in process coordination-complexity, interestingly, the proportion of production support staff has consistently diminished across all major assessments. These actors, who typically belong to the boundary organization(s) facilitating a given GEA, play an important coordination role and more recently, also function as knowledge-intermediaries (Jones *et al.*, 2012; Padgham and Jabbour, 2014 *forthcoming*). For first-generation assessments (those occurring before 1990) production support staff, on average, account for approximately 5% of the total pool of GEA participants.

More recently, this segment of actors has been reduced to less than 2% (e.g., for GEO-5, MA, IPCC and IAASTD). While this difference may seem trivial, in practice it is actually quite significant, as the additional burden of responsibility for these actors has been magnified by having to put in place and manage complex procedural and organizational structures that can handle the vastness and diversity of inputs, contributions and critical reviews. For example, rigorous multi-stage review processes—a key element of contemporary GEAs and particularly intergovernmental processes such as IPCC and GEO—have become highly taxing and complex exercises to coordinate. This is attributable in part to the implementation of more stringent protocols that address heightened concerns over transparency and scientific credibly (Shapiro *et al.*, 2010). However, it is mainly a function of the substantial proportional increase in the sheer number of reviewers engaged in GEA processes in the last four decades (**Figure 2.6.3**). For most recent GEAs examined (those occurring in the last 10 years), reviewers constitute the largest segment of stakeholders involved.

This of course has translated into a massive increase in the number and type of revisions requested of author teams. According to the IPCC Secretariat, the total

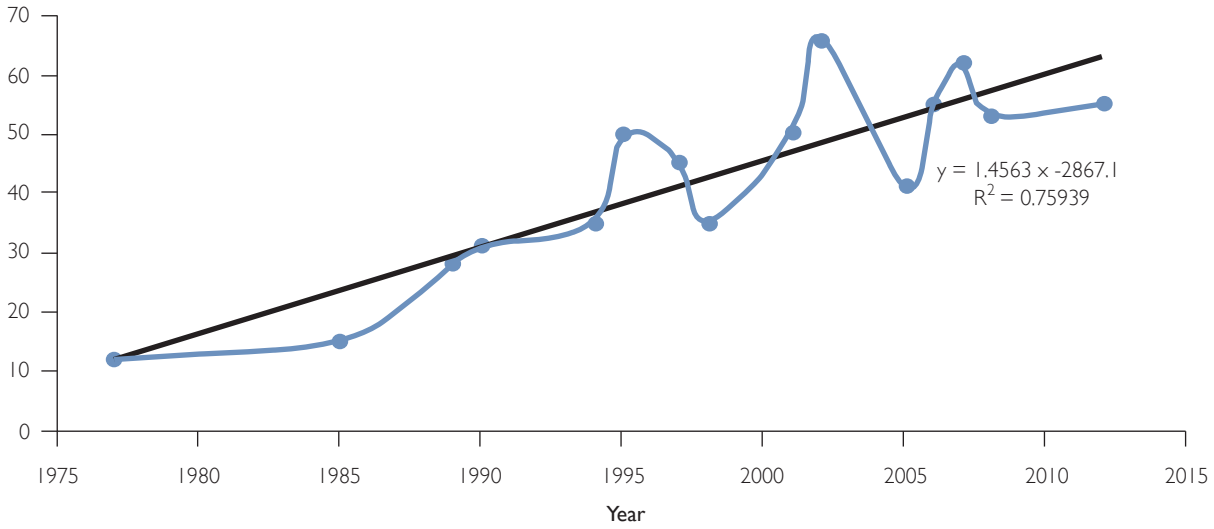

Figure 2.6.3. - Reviewers as a percentage of total GEA participants (n=15; from 1977 to 2014)

number review comments that AR5 draft manuscripts received, and dealt with (across all working groups), was in the order of 143,000. Albeit the situation is somewhat unique for the IPCC assessment process given the three Technical Support Units (TSUs) that provide organizational support to their respective Working Groups. Nevertheless, since the inception of the first IPCC report in 1990, dedicated personnel and resource allocations for production support have declined by 34% proportionally. Ultimately, the production support machinery for large-scale assessment processes (including GEO) has not kept pace with the additional process and semantic complexity, not least the increasing time pressures associated with contemporary GEA processes.

Another significant attribute-change in the evolution of GEAs, which has likely contributed to the rise in epistemic and semantic complexity, is the dramatic increase in the number of unique information sources, or references that assessments are drawn from, or rather, comprise. As illustrated in **Figure 2.5.4** comparing the number of source materials used in the five successive iterations of the GEO and IPCC reports, reveals six and 10-fold increases respectively, from the first reports to the most recent; with IPCC AR5 (2013/14) containing almost 24,000 references across it's three volumes. The first IPCC assessment report (FAR) on the other hand, included only 2,284 references. Not only is there a massive upsurge in the absolute number of source materials, but the 'citations to pages' ratio has also increased for GEO and IPCC from 2.1:1 to 5.6:1, and 2.5:1 to 6.7:1 respectively. In contract, of the first-generation GEAs examined—that were typically characterized by the natural science domains—the average ratio for citations to pages was 1.7:1.

Given that a core function of GEAs is to assemble, synthesize, interpret and organize all relevant existing scientific knowledge, the task for GEA experts and producers—juxtaposed to the ever increasing volume and diversity of information (which now spans almost the entire realm of social sciences and the humanities)—is fast becoming unmanageable. Vickery (1999; 2004) describes how the rapid expansion of scientific and technical literature together with and current patterns of information flow can overwhelm scientists and ill-equipped research institutions. The emerging culture of open access publishing and ongoing issues of fragmented information and data across disparate knowledge systems has further exacerbated the information-management challenges facing contemporary GEAs. As such, there is a need for a new generation of tools, models and frameworks better able to assemble, streamline, manage and integrate information, including those generated through different paradigms, for example local and traditional knowledge and more contextualized information from Governments to better support the future production of GEAs including policy-relevant analysis (UNEP, 2014). One viable option that's currently being explored at UNEP is to adapt aspects of the integrated environmental assessment processes and subsequent

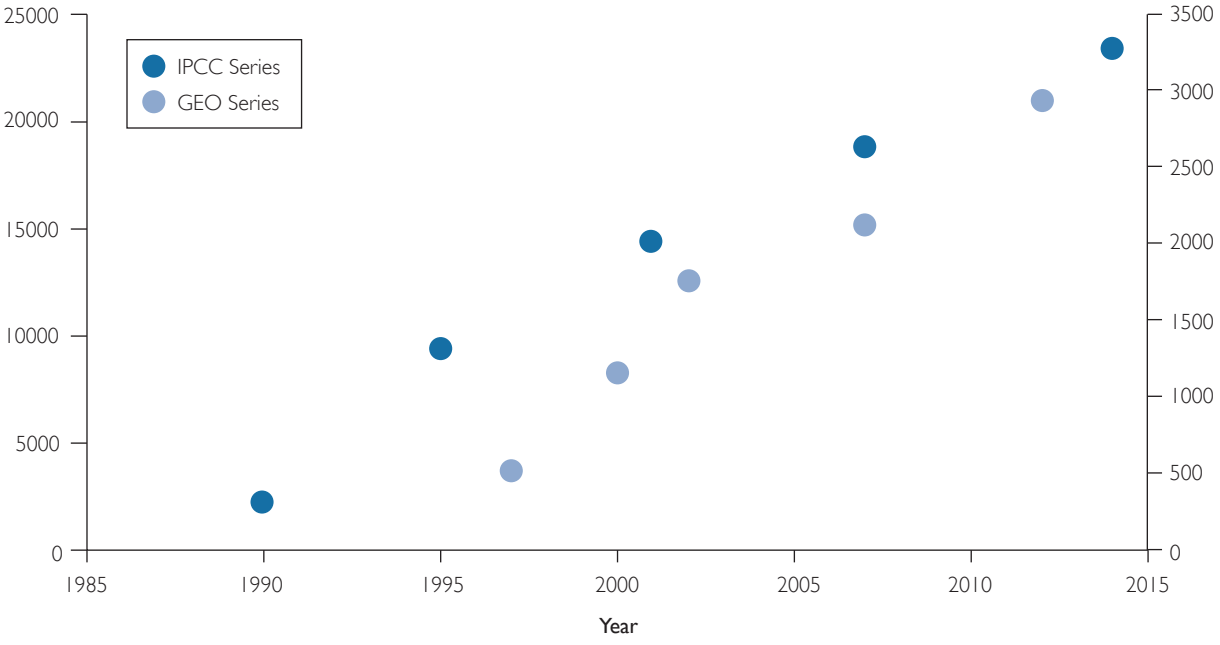

Figure 2.5.4 – Trends in the number of references/ source materials used in recurring GEO and IPCC assessment over five successive iterations

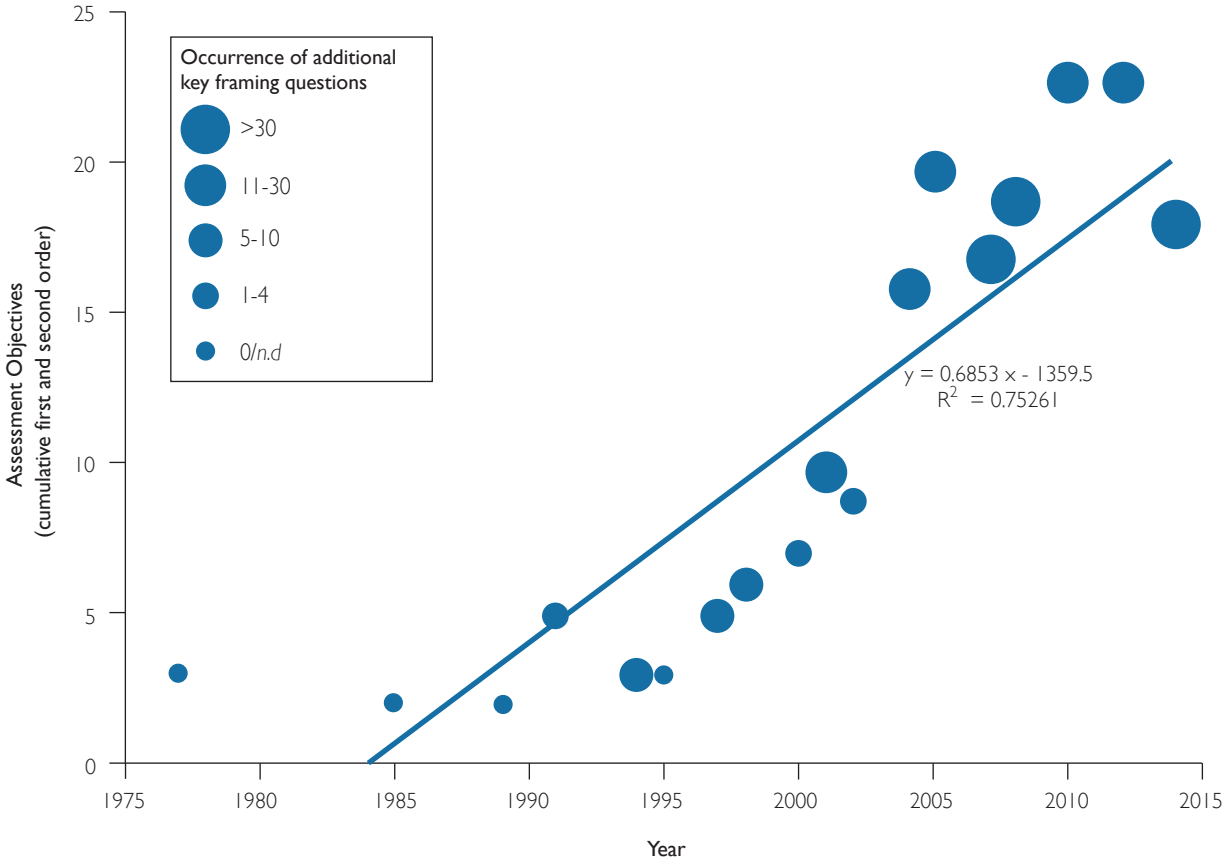

Figure 2.6.5 - Sharp broadening in the extent and scope of assessment objectives over time where the size of data point represents the relative occurrence of additional key framing questions.

assessment outputs to more networked, dynamic and inclusive knowledge generation through the use of innovative digital-based technologies. In this regard, the newly launched "UNEP Live" platform, is expected to serve as online working space for critical reviews and to facilitate the integration and synthesis of knowledge from different subject domains, using tools such as controlled vocabularies and consistent metadata tagging across all types of multimedia. The platform is also intended to manage and organize multi-directional information and data flows, and eventually facilitate the adoption of new international standards for quality assurance, in the field of informatics (UNEP, 2014).

Indeed such innovative efforts hold great promise in organizing information, streamlining data flows, and providing GEAs with a vehicle for promoting open-access, inclusivity and more strategic partnerships. However, beyond these much-needed technological improvements, particularly in the areas of knowledge management and integration, there is also crucial need for GEAs to better define and limit their scope of exploration, and similarly, to engage a much narrower set of objectives and ambitions. The irony, however, as our analysis reveals, is that contemporary GEAs (and particularly those completed in the last ten years) have experienced an inverse trend towards increasingly diffuse and less targeted operating mandates – as defined by their negotiated objectives and scope (**Figure 2.6.5**).

Not only has there been a sharp rise in the number of individual objectives per assessment, the number and range of specific scoping and framing questions that assessments are expected to address (now a prominent feature of intergovernmental GEAs—has also increased dramatically. Moreover, of the GEAs assessed, there was no evidence of any deliberate prioritization or ranking of such objectives; thus, leaving their relative importance open for interpretation. As a number of interview respondents noted, broadening the scope of attention with no clear alignment to the prevailing GEA storyline, diminished the intensity of analyses, created confusion and friction among experts, and exposed the assessment processes to be diverted by peripheral issues. In the absence of additional guidance and/or stricter measures on the development of GEA objectives, many assessment processes could soon be besieged by their own mandates and unwieldy bulk.

2.6.2 The shift to solution-oriented assessments

The results of our retrospective meta-analysis and careful document review of selected GEAs (spanning 1977 to 2014) and their evolving character, reveals crucial changes in their functional attributes and the emphasis of their outputs. Successive changes in the prevailing methodological characteristics, and, more broadly, the evolution of analytical approaches and organizational frameworks employed in GEA processes, for example, have made the appearance and proliferation of certain activities, outputs and qualities—once considered of secondary (if of any) importance—increasingly prominent.

Today, contemporary GEAs exhibit a much deeper engagement with, and emphasis on, future outlooks, response strategies, action-oriented narratives, and to varying degrees, public policy analysis. This is reflected in both the institutional objectives and available means for GEAs, and the actual content of their underlying reports. Taken together, the emergence and increasing emphasis of these attributes and their aggregate output, in relation to the evolving political and institutional contexts (Section 2.5), have lead many expert observers to believe that GEAs stand on the brink of a significant and transformational shift towards to solution-oriented enterprises.

While some of these variants and attribute-shifts have been institutionalized in the authorizing mandates and formal objectives of GEAs, others remain merely de facto relationships and are much harder to quantify. The following sections provide anecdotal evidence and qualitative data to support this emerging shift. The analysis has been informed by previous scholarship, document review, meta-analysis, and direct experience with a range of GEAs including the GEO process.

A review of the authorizing mandates of contemporary GEAs (**Table 2.6.2.1**) and subsequent experimental approaches and design-innovations introduced in recent high-profile assessments (including GEO-5, IPCC, Green Economy, and the Emissions Gap Report) seem to confer the growing appetite and demand for policy analysis and more integrative response options.

In studying the early development of the UNEP-led Global Environment Outlook (GEO) series, Pintér (2002) observed a notable incongruence between the changing expectations of GEA consumers (namely decision-makers) and the prevailing focus of many assessments:

Table 2.6.2.1 - Authorizing mandates of recent GEAs that exhibit

GEA	Year	
TEEB-II[2]	2008	*"Identification of opportunities for action, such as applying new or reforming existing policy tools; improve the way we measure our societal and economic wellbeing taking account of ecosystem benefits and losses in decision making processes and supporting analysis tools). Support policy action, by providing information and tools to help provide information that can be integrated into decision-making."*
IAASTD[3]	2008	*"…understanding of the effects of agricultural polices, practices, technologies and institutional arrangements on ecosystems and their goods and services…"*
IPBES[4]	2011	*"Support policy formulation and implementation by identifying policy-relevant tools and methodologies to enable decision-makers to gain access…and, where necessary, to promote and catalyze their further development…assessment of indirect drivers of change, including trade and policies in areas such as agriculture and spatial planning.*
GEO-5[5]	2012	*"…an analysis of case studies of policy options, that incorporates environmental, economic, social and scientific data and information and their indicative costs and benefits to identify promising policy options to speed up achievement of the internationally agreed goals"*

[2] The Economics of Ecosystems and Biodiversity: Phase 2 (TEEB-II) http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/d1.pdf
[3] International Assessment of Agricultural Knowledge, Science & Technology (IAASTD)
[4] Decision IPBES-2/5: Work programme for the period 2014–2018 http://ipbes.net/images/decisions/Decision%20IPBES_2_5.pdf
[5] http://www.unep.org/geo/pdfs/geo5/GEO-5_FinalStatement.pdf

"While some science assessments can distance themselves from the active domain of decision-making and continue to study and observe, policymakers seem to be increasingly demanding advice that is more directly useful in making decisions. As one of my interviewees pointed out, high level decision-makers expect more action orientation and would like to see assessment systems like GEO advise what action to take, in the form of legislation, in the form of economic instruments, in the form of preventive measures so that they do not make things worse" (Pintér, 2002: p.51)

The delicate balance between providing policy-relevant advice in scientific assessments, and the risk of being labeled "policy-prescriptive"—where the latter has long been considered taboo and even counter-productive—has been a rather nebulous line for GEAs, particularly when communicating responses and key messages. Robert T. Watson, a highly experienced and knowledgeable authority on GEAs, argues that global assessments must become more demand-driven and less supply-driven (Watson, 2005; 2012). However, he also asserts that:

"…assessments should assess options for action, but not recommend specific actions. They should assess the implications of different policy/technology decisions using the "if x," "then y" approach." (Watson and Gitay, 2004: p.17).

This modus operandi of being 'policy relevant but never policy prescriptive' has likely influenced the use of language or so-called 'linguistic repertoires', which in part, have shaped the nature of GEA narratives. However, the evolution of means, vis-à-vis the prevailing analytical and conceptual tools and frameworks for GEAs (see **Figure 2.2.1**: i.e., from observational techniques, to indictor-based analysis and integrated modeling, to scenarios and futures, and more recently public policy analysis), over time, has afforded contemporary GEAs a higher degree flexibility and leeway in engaging in a new territory of discourse.

Today, contemporary GEAs reflect more direct, decisive language in their recommendations, key messages, and underlying narratives, which would once have been dismissed or rejected on the basis of being overtly 'policy-prescriptive'. Discourse analysis of core GEA messages—as articulated in either the summaries

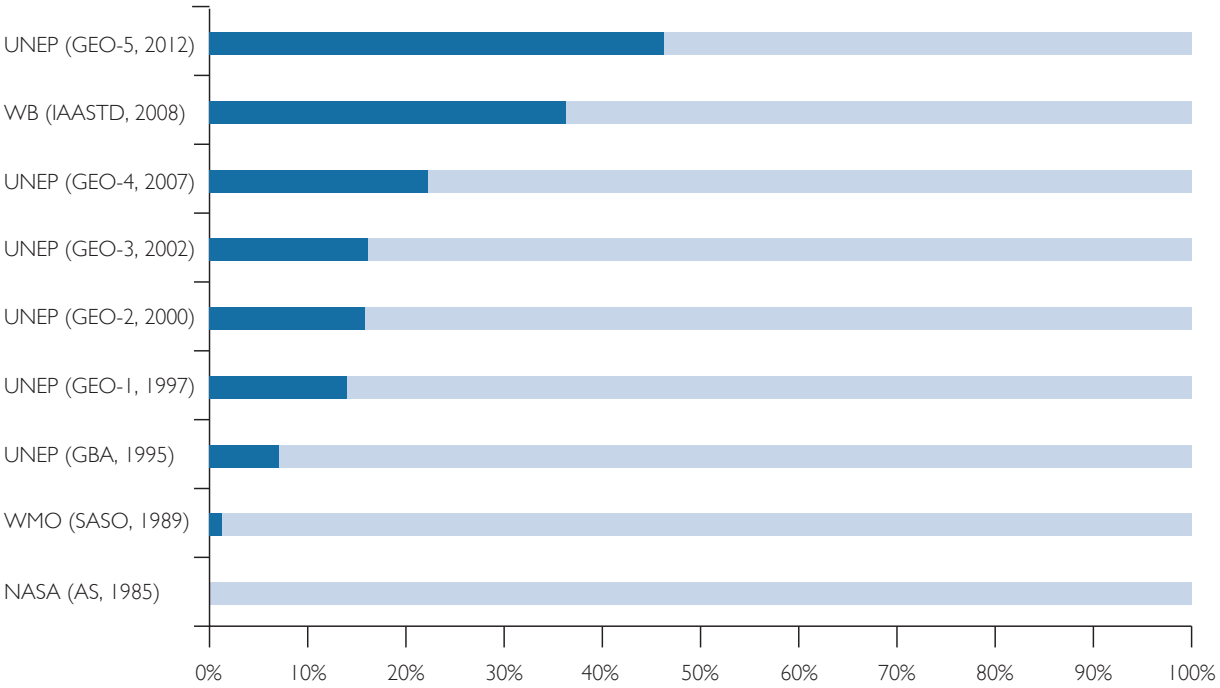

Figure 2.6.6: Proportion of selected GEA reports representing solution-oriented material, analysis and findings as reflected in narratives, graphical illustrations, tables, data and supporting imagery.

[2] When used explicitly as a noun in the context of solving a problem or dealing with a difficult situation; and discounting instances of solution to mean a liquid mixture.

or stand-alone key messages pooled from eight GEAs published between 1985 and 2012 reveals a ten-fold and eight-fold increase in the use of the terms *"political action"* and *"policy response(s)"* respectively. Similarly, the use of the word *"solutions"* in the GEO assessment series has risen consistently in successive iterations, from nine instances in GEO-1, to 99 instances in in GEO-5. Furthermore, as illustrated in **Figure 2.6.6,** the proportion of selected GEA reports (including all five GEOs) that represent solution-oriented content, as reflected in their narratives, graphical illustrations, tables, data and supporting imagery. Nearly 44% of the content presented in GEO-5 was found to be solution-relevant material, in contrast to the 1985 NASA-led Atmospheric Ozone assessment, which comprised less than 1%. Similarly, discourse analyses on 320 source materials of four GEAs[6] from 1985, 1995, 2008, and 2012, reveals an increasing reliance on solution-focused information with 0%, 12%, 47% and 55% respectively. Taken together, these changes correspond to the perceived shift towards solution-oriented GEAs expressed by many stakeholders and researchers interviewed in the context of the FOGEAM project.

Similar trends are occurring in other assessment-related fields, for example, environmental risk assessment. Finkel (2011) describes an emerging reversal in the functional and conceptual practice of traditional risk assessment; where for over three decades the attention and resources have squarely been placed on dissecting problems rather than on evaluating management pathways and tangible solutions to mitigate risk. A growing number of researchers and practitioners engaged in risk assessment have begun to challenge the existing paradigm and are recognizing the need to fundamentally re-orient the entire practice, both analytically and institutionally, toward solution-focused assessments.

2.7 Current state of play: Growing calls for GEA reform

Over the last two decades the global environmental assessment (GEA) landscape has gradually become a crowded and somewhat fragmented space (**Figure 2.3.1**). Many expert observers have recently characterized the landscape as being poorly coordinated and inadequately systematized across the different institutions and domains, and have criticized the duplication and overlap that has resulted (UN 2014; Laguna-Celis, 2012; Watson 2013). There is rising level of dissatisfaction, and confluence of opinion among many stakeholders and expert observers (across science and policy communities) engaged in GEAs that certain reforms are both needed and inevitable.

A range of intergovernmental processes related to the environment, and other multilateral fora, including for example, the post-2015 development processes, refer to the need for more integrated information and knowledge approaches to promote policy coherence; improved performance indicators for public policy analysis; enhanced and wider use national data-flows of linking to more contextualized knowledge from government sources; and up-to-date evidence from the business sector; which inform society not only about risks—both current and unintended—but also opportunities and available choices.

The emerging reform debate has also brought attention and increasing scrutiny to the institutional and management structures of GEAs (vis-à-vis boundary organizations and international panels) over how knowledge and information flows are mediated, and how interactions between multiple epistemic communities of practice are facilitated. While several reform debates are focused on procedural issues of improvements in transparency, legitimacy and credibility – they have also triggered a broader discussion on more fundamental and less incremental issues including the need for deliberately inclusive knowledge systems, addressing conflicts of interest, governance and management structures, and the need to tackle a number of methodological challenges (Weichselgartner and Kasperson, 2010; Reinecke *et al.*, 2013; Hoppe *et al.,* 2013; Hogl *et al.,* 2012; Watson, 2013; Shapiro *et al.*, 2010; Tollefson, 2010).

A number of experts and prominent scholars have echoed similar concerns and assert that for future GEAs to be influential, they must become much more demand-driven; regionally and sub-regionally applicable; tolerant of non-traditional knowledge systems; co-designed and co-communicated by their relevant user groups; and, accessible through a more dynamic digital or web-based interface capable of supporting customizable, near real-time information. (Watson, 2013; McGlade, 2014; Leemans, 2008; Solomon and Manning, 2008; Schiermeier, 2010; Nature 2013; Science

[6] These include the 1985 Ozone Assessment, the 1995 Global Biodiversity Assessment, the 2008 International Assessment of Agricultural Science, Technology for Development, and the 2012 Fifth Global Environment Outlook.

2011). These commentaries provide important insights on current and future directions of GEA practice and efficacy.

Despite these constraints, and the persistent and growing momentum for reform, the demand for GEAs remains exceptionally vibrant (perhaps more than ever). As demonstrated in **Table 2.7.1**, there are strong signals for enhanced international political support for existing of scientific assessment platforms such as GEO and IPCC, and widespread support for the creation of new platforms, institutions, scientific panels and assessments (IPBES, GSDR, UNEP Live; SAB etc.). Moreover, as illustrated by the results of our interviews and document analysis, GEAs continue to be seen as occupying (or the potential to occupy) a unique and valuable space at the science-policy interface. In fact, many observers including a number of our interview respondents, believe that the current reform debate provides a window of opportunity to take stock and reflect on the lessons of the last 40 years, and in which transformational changes and institutional realignments may have the chance to come to fruition.

Table 2.7.1 – Recent High-Level Intergovernmental Endorsements for existing/ future GEAs

Month Year	(Resolution/ Decision) Fora	Declaration of endorsement/ Internationally agreed recommendation	Relevant GEA
Jan. 2012 Sept. 2012	(A/RES/67/290o.p.1) UN Secretary-General's High-level Panel on Global Sustainability UNGA Resolution	"The Secretary-General should lead a joint effort with the heads of relevant international organizations…to prepare a regular Global Sustainable Development Report that brings together information and assessments currently dispersed across institutions, and analyses them in an integrated way" [Para 254; recommendation 50]	GSDR (new)
Apr. 2012	(A/RES/65/162o.p) (UNEP/IPBES.MI/2/9) UNGA Resolution UNEP Governing Council Decision on IPBES	"Decide to establish an independent inter-governmental body to be known as the Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services …performs regular and timely assessments of knowledge on biodiversity and ecosystem services and their interlinkages, which should include comprehensive global, regional and, as necessary, sub-regional assessments…" [para]	IPBES (new)
June 2012 July 2012	(A/CONF.216/L.1) (A/RES/66/288) UNCSD Rio+20 Outcome Document and UNGA Resolution	"…stress the need for the continuation of a regular review of the state of the Earth's changing environment and its impact on human well-being and, in this regard, we welcome such initiatives as the Global Environment Outlook process…" [Para 90] "Promote the science-policy interface through inclusive, evidence-based and transparent scientific assessments [Para 76(g)]	GEO (existing)
Dec. 2012	(UNEP/GC.27/2.1) UNEP Governing Council Decision	"..governing body of UNEP will promote a strong science-policy interface by reviewing the state of the environment and by building on existing international instruments, assessments, panels and information networks, including through an enhanced summary for policy makers of the Global Environment Outlook" [Para 8, decision 27/2]	GEO (existing)
Feb. 2013	(A/64/L.18/168Kb) (A/RES/67/78) (A/RES/63/111) UNGA Resolution and Law of the Sea	"...to establish a regular process under the United Nations for global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments, as recommended by the World Summit on Sustainable Development [Para….]	AoA (new)
Sept. 2013	UNGA – HLPF UN Secretary-General's Scientific Advisory Board	"… identifying specific needs that could be addressed by on-going assessments (e.g., IPCC or the IPBES); and advising on issues related to the public visibility and understanding of science."	(new)
June 2014	UNEA	GEO-6 decision:	GEO (existing)

2.8 Discussion and conclusions

On the one hand, the multiplicity of assessments in recent years is a testament to the growing demand for GEAs, particularly at the highest levels environmental decision-making (as illustrated in **Table 2.7.1**). However, the growth trend is also likely pointing to: (1) the increasingly competitive dynamics and loose coordination between boundary institutions; (2) a diffusion and devolution of GEA mandates and scope away from specific multilateral processes; (3) a rapidly evolving science-policy interface (including dual accountability of boundary organizations); and (4) and a strengthened demand for (importance of) consensual evidence-based knowledge on solution-pathways and policy responses (Mee 2005; MCC Workshop 2013; Nature 2013).

Recent departure in the operating mandates, as articulated in scope and objectives, coupled with the suggests a shift in the analysis and framing of GEAs, emphasizing approaches and analytical methods that are less circumscribed in their ambitions to engage with public policy assessments and critical evaluations of policy responses. However, the necessary methodologies, tools and capacities to arrive at solution-oriented GEAs are not well enough advanced, as seen in GEO-5. Complementarities between logical GEA scope and appropriate epistemic methods depend on one another not only for their merit, but also for their application. Yet, over the years there has been a steady decline in the emphasis and priority that GEAs place on methods-development, as illustrated in the analysis (**Figure 2.8.1**).

The prevailing epistemic communities and knowledge-systems behind GEAs, and the current constellation of actors engaged in their production, are likely not sufficiently equipped to carryout the range of analyses that solution-oriented assessments require (i.e., systematic comparison and analysis of public policy responses and evaluations of existing macroeconomic options).

A new configuration of GEAs towards solution-oriented demands also needs to find ways to align macroeconomic and ecological rationales. This will require an evolution in the normative structures, systems and modalities that GEAs employ to identify, select, and engage stakeholders. Moreover, the demarcation of roles, mandates and accountability between traditional 'scientific', 'political' and 'intermediary' actors and institutions currently engaged in GEAs, including the boundary organizations that facilitate them, needs rethinking (Jasanoff, 2012).

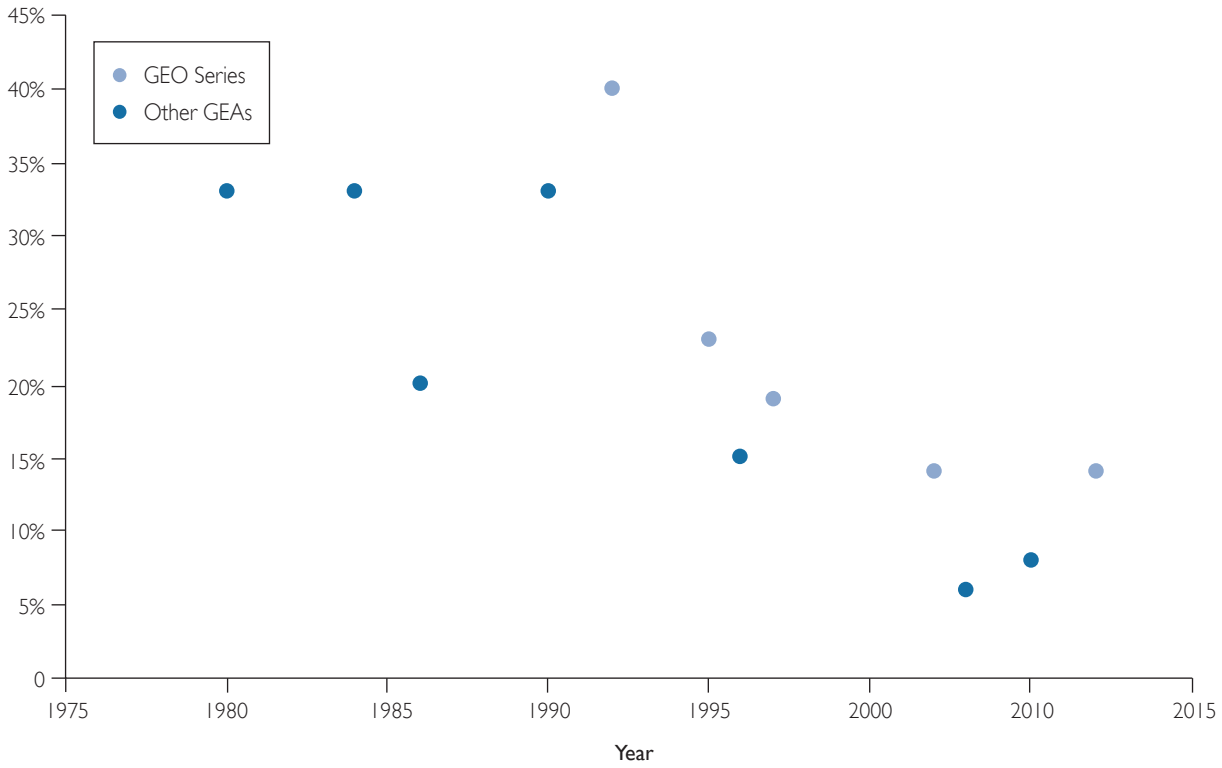

Figure 2.8.1 – Decline in methods-focused objectives and framing questions in GEAs

> *"…nearly all the information that governments really need for policy will require that scientific researchers move into unfamiliar and uncomfortable territory. Real policy in this domain won't simply be guided by the pure facts and analysis that the IPCC excels at answering in ever-finer resolution. What really matters now are answers to questions about human behaviour, including political action — the realm of social sciences and the humanities that the IPCC and governments have been most uncomfortable letting into the room." (Victor, 2014: p.853)*

There is also a growing need for a new generation of tools, methods, and frameworks that are better able to integrate information generated through different paradigms, including local and traditional knowledge. As demonstrated in recent International Energy Agency processes that include option oriented policy analysis (such as GEO-5, the fifth Assessment Report of the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), deliberately inclusive knowledge systems will be essential to the post-2015 agenda.

Contemporary assessments like GEO and IPBES, that have already made impressive strides in this direction, could be further developed and adapted to usher in a new style of stakeholder engagement, more inclusive knowledge-integration, and a new generation of actors (including experts from the social sciences and humanities, policy practitioners, and science-policy intermediaries) to address new challenges. New technologies and innovative digital platforms also have a role to play, both in addressing the challenges of integrated policy assessments, and their mounting epistemological complexity. Enhanced quality-assured national data flows through innovative web-based knowledge management platforms such as UNEP Live, can also help link to more contextualized assessment information from Governments to support policy-relevant analysis. Ultimately, more reflexive or anticipatory decision-making approaches and interventions (at all levels) would benefit from GEAs being designed and framed in tractable ways so that they offer specific modes and loci for action and so that they are supported by more dynamic and innovative forms of knowledge exchange across the science-policy interface

Our analyses seem to indicate the that current institutional arrangements and processes for GEAs, including fundamental design attributes, analytical and conceptual frameworks, and the required means to achieve its objectives have not kept pace with the changing context and reoriented focus that is being demanded of contemporary GEAs. The entire GEA landscape seems to be in a state of transition. The traditional normative functions and original ambition and mission of this social-enterprise are increasingly at odds, or at least, misaligned, with the emergent geopolitical context for environmental multilateralism and IEG (including the institutional framework for sustainable development) and the expectations and new ambitions that GEAs are increasingly framed in.

An important and under-appreciated aspect of designing more effective and relevant future GEAs we believe, involves a consideration of strategic alignment with, and continuous adaptation to, the evolving political context and broader institutional setting that GEAs are conceived and received in. A current lack of organizational reflexivity and alignment (or responsiveness) has manifested in a separation between GEAs (particularly their framing) vs. international environmental governance (IEG) and existing multilateral structures. This discontinuity between the ambition and demand for solution-oriented analysis or goal-oriented GEAs, and a failure to connect to legitimate structures, is both a missed opportunity, and likely obstructing the potential utility of GEAs and their ability to influence change.

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Chapter 3

Impacts of GEAs: an analytical framework

ABSTRACT

This chapter explores one of the most central and complex questions in research on GEAs: What is the value of GEAs for policy processes? The chapter proposes adopting a more nuanced view on the potential impacts of GEAs. In particular, it suggests that the main impact of GEAs on policymaking occurs via their contributions to public policy discourses, in particular, by providing reliable answers to key public policy questions. Relying on an empirical exploration of the impacts of GEO-5, the chapter confirms that GEAs can and do inform policy discourses through multiple channels. Key actors engaged in the production of GEAs are identified as important channels for communicating and integrating GEA findings into policy discourses. While multiple examples show that the GEO-5 provided intellectual resources for policy discourses (e.g. in the context of the definition of the Post-2015 Development Agenda and in multiple national discussions), many interview respondents believed that the broader public dissemination efforts for GEO-5 might have suffered from limited resources allocated to communications and outreach. One important lesson drawn from the interviews with GEO-5 participants is that the lack of a precise definition of envisaged impacts, and/or the misalignment of these envisaged impacts with available resources, can impede the conduct of the assessment and the achievement of the envisaged impacts. A key emerging lesson is that establishing clear expectations concerning the envisaged impacts at the beginning of a GEA process, in cooperation with all the relevant stakeholders, and consistently and systemically translating these envisaged impacts into the process of choosing the appropriate objectives and means of the assessment, are critical for its success.

Key Messages

1. GEA impact-conceptualization is complex and remains underdeveloped. This chapter conceptualizes GEAs as intellectual resources that contribute to shaping policy discourses, which in turn are essential components of complex policymaking processes.

2. The often-perceived lack of influence of GEAs is partly attributable to a relatively narrow conceptualization of GEA impacts (including GEO-5) as directly shaping public policy, which in turn fails to account for the complex dynamics of real-world policy processes. Besides the need to advance the conceptualization of GEA impacts, a key challenge for future research is to evolve new methods for the measurement and monitoring of GEA impacts on policy discourses.

3. Heightened concerns over the imprecise definition for and lack of communication of, the envisaged impacts of GEO-5 were a believed to be an important obstacle. Future GEAs should ensure that envisaged impacts are sufficiently precise and communicated well in advance to all contributors to the assessment.

4. Future assessment processes would likely benefit from an emphasis on collective deliberation between the actors who are requesting the assessments with those responsible for producing them, including the lead authors.

5. This discussion could clarify: (i) the core audiences targeted by the assessment and possibly the related relevant, existing policy fora the GEA is likely to inform, along with how the demand for intellectual resources in these fora will be addressed; and (ii) the thematic focus of the report, particularly the public policy questions that are to be addressed. This pre-assessment exercise should be clearly communicated to all participants and drive the entire assessment process.

3.1 Introduction

Many global environmental problems continue virtually unabated and are a major societal concern. The outcome of the United Nations Conference on Sustainable Development (also known as the Rio+20 conference) reemphasized the importance of the scientific contribution to sustainable development, as well as the value of strengthening the science-policy interface, including through scientific assessments.[1] However, while some assessments have been described as highly influential, others have been found to lack influence (Mitchell *et al*., 2006). Understanding the impacts of science on society, the economy, and particularly policy change has attracted a lot of scholarly attention. Still, evaluating the contribution of scientific knowledge to policy change remains a formidable challenge.

Identifying and tracing the process by which a global environmental assessment (GEA) may generate learning, which in turn might lead to policy change, and assessing the magnitude of these outcomes is hampered by a number of analytical and methodological challenges. The difficulties with establishing counter-factual—what would have been different had the GEA not been produced—and the changing nature of the outcome over time (Radaelli, 2009) are among the most critical challenges. Although it is necessary to draw lessons for the design of future GEAs, examining learning outcomes within a short timeframe impedes the identification of the "learning buds that are about to blossom," while looking at them over a longer timeframe may reveal multiple contributions (Radaelli, 2009; Horton, 2013). In addition, tracing the contribution of a specific GEA to policy change is complicated by the multitude of additional factors that influence the outcomes of policymaking processes. For example, changing governing coalitions or major shifts in the socioeconomic situation of a country can have significant impacts on policy (Sabatier, 1988; Horton, 2013). Furthermore, a single document, such as a GEA, does not usually generate direct policy change. Rather, it is the cumulative impact of scientific exercises that influences mind-sets and discourses over longer periods of time (Sabatier, 1988; Horton, 2013).

Despite these challenges, conceptualizing and evaluating the impacts of GEAs remains a topic of great interest as the impacts of a GEA crucially determine its social value. In addition, it is essential to understand how GEAs contribute to policy changes in order to design better assessments and to identify and involve the most relevant target audiences. Here, we propose a conceptualization of the influence of GEAs based on their contribution to policy discourses, with learning and the use of knowledge as constitutive parts of this process.

Although, we acknowledge that discourses are only one important factor affecting policy change, it has been demonstrated that they exhibit strong explanatory power (Schmidt and Radelli, 2004). We assume that the contribution of intellectual resources by GEAs to policy discourses can be an important asset—in particular participants in a given GEA—that would underpin the interventions of various actors in multiple policy settings. In order to explore this concept, this chapter aims to answer the following question: What is the value of GEAs in policy processes?

As discussed in Chapter 1, the GEA Harvard project (Mitchell et al., 2006; Farrell and Jäger, 2006; Jasanoff and Martello, 2004), which was based on the early work of the Social Learning Group (2001), advanced the conceptualization of GEAs as eliciting an influence (or lack of influence) in various issue domains. This chapter builds on the Harvard GEA approach. However, it diverges from this body of work in one important way: it is anchored in discourse theory. Instead of considering discourse as one element of an issue domain, we propose analytical tools that can trace the ideas carried by GEA contributors from the forum of ideas that the GEA constitutes to the policy arena by the means of discourse. As such, we hope to advance the understanding of the contributions of GEAs to policymaking through their contributions to discourses.

We propose the adoption of an innovative and complementary set of theoretical lenses to understand the role played by GEAs in policymaking processes in a manner that is more nuanced and differentiated than the existing approaches. We do this in three steps: First, we present the benefits of the discourse approach as it relates to the analysing the influence of GEAs (Section 3.2). Second, we propose to understand the contribution of a GEA to policy discourses by tracing how the ideas it entails shape the stories lines told by its participants (Section 3.3). Third, we discuss the pros and cons of this approach and make recommendations for the future design of GEAs (Section 3.4). We not only hope to contribute to the understanding of the influence of GEAs in policymaking processes, but also

[1] Rio+20 Outcome document, paragraphs 48, 76, 85, 88.

to provide conceptual building blocks to inform future GEA impact and outreach strategies. Yet, this paper leaves the large-scale empirical testing of the analytical framework to future studies.

3.2 A discourse perspective on GEAs

Following a brief explanation of why we have chosen not to adopt a quantitative framework and analysis of GEA impacts on policy, this section discusses the benefits of adopting a discourse perspective, as it relates to the influence of GEAs (3.2.1), and the needs for additional theorization (3.2.2).

3.2.1 Why focus on the influence of GEAs on discourse?

An appealing approach for assessing the impacts of a GEA on policy change might be a quantitative analysis of references to the GEA in the media. Schreurs *et al*., (2001) show the expediency of this approach for understanding issue-attention cycles for global environmental risks. However, selecting several newspapers to measure the resonance of specific topics means that the project will be geared toward understanding the resonance of an issue in a specific—in their case elite—community. Although this exercise could be replicated for larger communities using internet-based search engines, such an approach faces numerous challenges. The most important is the comparability of cases, as GEAs differ based on their institutional anchorage, amount of resources (including those directed towards outreach), and history (some of them are part of a series of assessments), which make a quantitative approach difficult to perform in a scientifically robust manner. In addition, such an approach is less useful for identifying the precise channels of influence for a specific scientific exercise or "study" (Weiss, 1981). Also, as the remainder of this chapter will demonstrate, impacts of GEAs can be very nuanced and measuring some them in terms of numeric indicators might be of little use or even misleading. In addition, Schreurs *et al*., (2001) focused on global environmental risks as their object of study, whereas we look at GEAs as social exercises, which are clearly identifiable as sources, but have effects that are much more difficult to trace. Methods such as case studies and process tracing are the most helpful for comprehending the *channels* and the *nature* of the contribution of a study to specific decisions (Weiss, 1981). For these reasons, we chose to conduct a qualitative exploration—an approach that is similarly employed by the Harvard project. We hope that this qualitative contribution will contribute to future work on this topic by identifying categories that quantitative analyses might be able to evaluate numerically.

Our investigation departs from the approach taken by the GEA Harvard project by taking stock of the criticisms that have been directed at the foundations of its conceptualization of GEA impacts. The GEA Harvard conceptualization is rooted in Sabatier's (1988) advocacy coalition framework and his collaborative work with Jenkins-Smith (1993; 1999), as well as further work on global environmental risks and the issue domain approach (Schreurs *et a*l., 2001). At the core of this approach are the causal mechanisms by which policy change takes place: Through changes in various elements of an issue domain, as defined by the beliefs, goals, interests, resources, and strategies of individuals, discourses, framing, and agendas, as well as changes in policies and the state of the environment. Among the many theorists of policy processes (see Sabatier, 2007), the work of Sabatier (1988; 2007) sparked a body of knowledge on the specific role of *learning* in policy change. However, Sabatier and his colleagues acknowledged that the scholars who use this approach have left several questions unanswered. In particular, the conditions through which policy learning is facilitated, especially across policy coalitions, remain under-researched (Weible *et al*., 2009). Fischer (2003), arguing in line with Hajer (1995), attributes this oversight to the inability of the Advocacy Coalition Framework to provide analytical tools to convincingly trace the causal mechanisms by which policy learning contributes to policy change and, in particular, *how* and *why* policy changes come about. In particular, Fischer points to the main weaknesses of the two hypotheses proposed by Sabatier (1988) related to the conditions by which ideas generated in professional fora contribute to policy change: First, the prestigious character of the forum, and second the existence of professional norms. According to Fischer, the inherent rationalistic bias of the theory distorts the ability to understand the role of interests and *story lines*—constructed discursively—in empowering certain ideas.

Going beyond the policy-learning strand of the literature, Hajer and Fischer add a discursive dimension. In their theory, discourses act as the glue for the coalitions. This conceptualization enables better connecting learning with the characteristics of an issue domain, including beliefs, interests, and strategies. They show that discourses are the medium by which ideas travel from professional fora, where ideas are generated, to policy arenas, where actors with the power to

formulate policies argue with one another discursively and rely on the intellectual resources provided by the forum (Radaelli and Schmidt, 2004). Thereby, Hajer and Fischer connect the use of knowledge theory (i.e., Weiss, 1979) to theories of policy learning. They argue that learning is not exempted from interest but is shaped by the interests and beliefs of the individual. Discourses should not be seen as one characteristic of an issue domain, next to beliefs and interests, but as having the potential to frame and change interests, institutions, and culture (Radaelli and Schmidt, 2004).

Hajer describes discourses as "an ensemble of ideas, concepts, and categories through which meaning is given to a phenomenon" (Hajer, 1993) and elaborates that they are typically constructed and reconstructed through a distinguishable set of practices (Hajer, 2005). For Schmidt and Radaelli (2004), a discourse is defined by way of its substantive matter "in terms of its content, as a set of policy ideas and values, and in terms of its usage, as a process of interaction focused on policy formulation and communication." Discourse analysis theory conceptualizes learning and the use of knowledge as two entangled parts of the same discourse. Actors discursively use knowledge to frame interests and advocate for certain positions. Discourses are built upon storylines that are used by individual actors. A discourse is often defined as a collective phenomenon, which is fed by the convergence of multiple individual story lines. These story lines are based on the facts that people collect on social, biophysical phenomena (Hajer, 2005). It is through the framing and formulation of ideas, concepts, and categories, and through the successful persuasion exercised by the actors supporting the discourse on other actors, that a discourse can come to progressively dominate a discursive field. A "discourse helps to create an opening to policy change by altering actors' perceptions of the policy problems, policy legacies and 'fit,' influencing their preferences, and thereby, enhancing their political institutional capacity to change" (Schmidt and Radaelli, 2004 pp. 188). Even though the individual use of information may widely vary in nature (Weiss, 1979), scholarly research has emphasized the domination of a discourse as a crucial step towards policy change. The mechanism by which discourses contribute to policy change has two features: First, a discourse can undergo a structuration process whereby it begins to dominate others (Hajer, 1993) and it is widely used by individuals to conceptualize the world (Hajer 2005). Second, a discourse can go through an institutionalization process, whereby it solidifies in the form of institutions and organizational practices (Hajer, 2005 pp. 303). Monitoring of air quality in cities is an example of the institutionalization of the discourse on acid rain (Hajer 2005). The institutionalization of a discourse requires policy processes to be conducted according to the ideas of a given discourse (Hajer, 2005). Discourse structuration and/or the creation of institutions to deal with the issues underlined by the discourse indicate that specific ideas have overcome divergent interests and values (see Chapter 5), historical path dependencies, and other inherent obstacles to policy change. If the discourse satisfies the two criteria of structuration and institutionalization, one can say that it is dominant (Hajer 2005). This requires that the discourse achieve a high degree of persuasion among various discourse coalitions (Schmidt and Radaelli, 2004). In the environmental field, it often means that a discourse has managed to transport ideas from a professional forum to a policy arena and beyond that to the general public. Indeed, since the public has to vote based on political programs, it must be convinced by the discourse entailed in a political programme and, thereby, legitimize public policy action.

Horton (2013) proposes a simple model that combines target audiences and the metaphor of the "impact journey", which features the travel from a research idea to final benefits, to illustrate the complexity of the mechanism by which ideas contribute to policy change. He argues that although such a journey is never linear, a linear framework helps to understand the impact of research. According to him, a change in ideas and knowledge followed by the distribution of this information (in our case through working on a GEA) leads to a change in understanding and application of knowledge in a particular context by means of dialogue. As a result, behavioural change can initiate a change in conditions, for instance, of the environment.

What lessons can be drawn from the maturation of this field of research? Ideas travel in a very gradual manner from the fora in which they are born or incubated (in our case a GEA) to the policy arenas in which they are taken up to promote or argue against policy change. The mechanism by which that happens can be depicted as follows: individuals take up the ideas produced in a GEA through learning, which is shaped by the beliefs, preferences, and interests of the individual. These same individuals use ideas to feed the story lines they tell. These story lines converge to form discourses. As demonstrated by recent scholarly work, a (well-functioning) science-policy interface can be characterized as an iterative process

involving co-generated knowledge (Jasanoff, 2004) with numerous feedback loops. For instance, learning from an assessment can inform a subsequent or more thematically specific or regionally contextualized assessment, which might then bring about policy changes via impacts on discourses. Thus, a GEA may also contribute to policy change in such indirect manners. A GEA can also inspire new collaborations among the stakeholders involved in the assessment process or further research projects, which may initiate a new impact journey. Conversely, a change in discourse may also feed research orientations. We offer below a very simple representation (see **Figure 3.1**) of the mechanism by which knowledge penetrates policy fora through discourse. The arrows depicted in **Figure 3.1** are intended to be illustrative and can by no means cover all possible feedback loops.

3.2.2 The need for further refinement of discourse theory to analyse GEAs

Discourse analysis theory was not designed to trace the influence of a particular piece of information, but to understand the causal mechanisms by which ideas, usually emerging simultaneously from various sources, contribute to policy change. Given our current focus on an exercise rather than an issue domain, discourse theory requires further refinement in order for it to be applied to GEAs. Assessment producers may expect a GEA to produce a discourse of its own. However, considering the variability in responsiveness to assessments (Mitchell *et al.*, 2006), it might be more realistic to expect a GEA to provide intellectual resources to support specific *elements* of individual story lines. The main strength of the argumentative turn in policy analysis, from which discourse theory emerged, is to bridge the gap between institutional and actor-centred analyses (Schmidt and Radaelli, 2004). As such, it is important to investigate the micro-processes that take place at the level of the individual (Zito and Schout, 2009), the manner in which individuals construct story lines, and their use of intellectual resources (e.g., Fouilleux, 2004; van den Hoven, 2004). In doing so, we investigate the contributions of GEAs to policy learning, as well as the use of knowledge by GEA contributors through story lines. The discourse literature does not systematically differentiate individual from general discourses. Thus, unless specified, we use the term "discourse" to describe both individual story lines and collective discourses.

"Policy learning" has been conceptualized in many different ways (Howlett and Bennett, 1992; Grin and Loeber, 2007)—from a simple dichotomy between learning about policy improvement and political learning (e.g., about how to better win elections) (Gilardi, 2010) to highly complex analyses of the various facets of learning (Dunlop and Radaelli, 2012). For Hall (1993), learning consists of the "assimilation of new information" and results in "a process of updating beliefs about key components of policy." This definition has the advantage of not only focusing on *change,* such as the one adopted by Sabatier's school, but on the update, which entails the possible reinforcement or

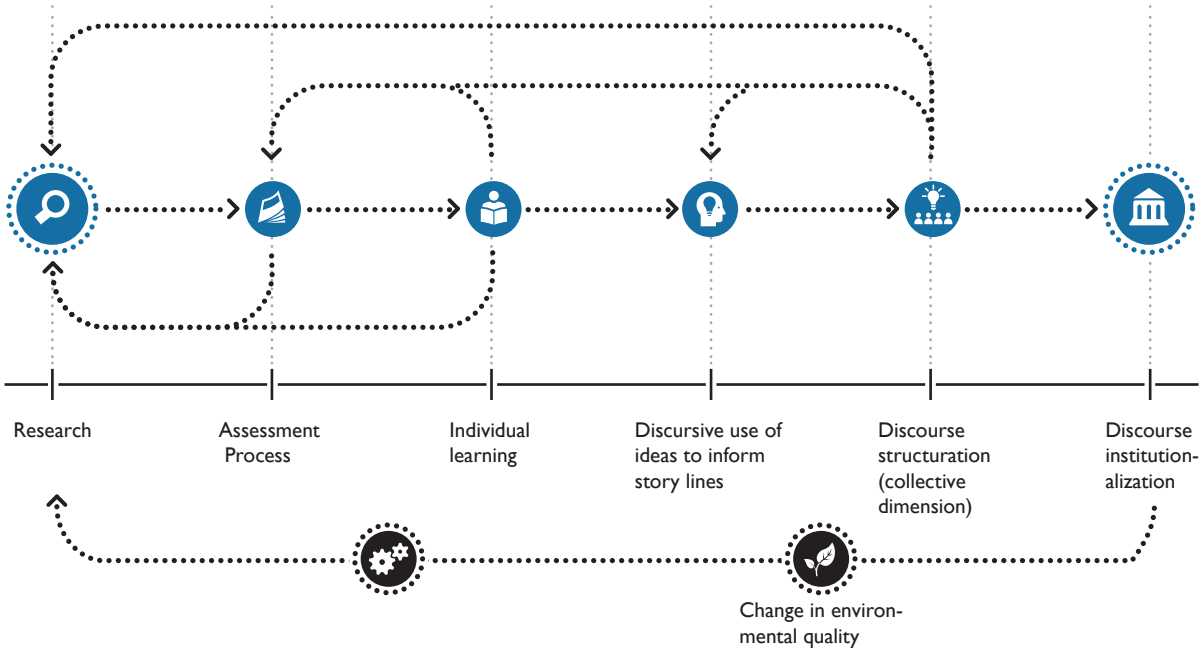

Figure 3.1. – Conceptualization of the "impact journey" of GEAs to policy via discourses, including some potential feedback loops.

confirmation of existing beliefs. Thus, learning can lead to the use of knowledge in multiple ways (Weiss, 1979; Radaelli, 2009).

While the work conducted on categorizing policy learning and uses of knowledge (Radaelli, 2009; Dunlop and Radaelli, 2012) has been enlightening, these theories do not provide practical analytical tools or methods to empirically trace *which* ideas start travelling from professional fora to policy arenas, especially not in the specific case of GEAs. In order to better understand into which contexts and policy fora the ideas contained in a GEA will enter and through which channels this happens, we propose adding two analytical building blocks to the discourse theory framework that are specifically designed to better understand the role of GEAs in policy discourse: Inspired by Howlett and Benett's approach to learning (1992), we propose a discussion on *whose discourse* may be informed by a GEA and *which ideas* may constitute building blocks of discourses.

Hajer (1993) describes discourse analysis as the exploration of argumentative structures in written and spoken documents. We propose that GEAs can be understood to address multiple questions, the responses to which provide arguments for individual story lines. Exploring how individual actors learn from GEAs and subsequently feed their story lines with this argumentative material promises to provide a better understanding of the contributions of GEAs to policy discourses.

In summary, we suggest using discourse theory as an anchorage port to investigate the influence of GEAs, as well as a refinement of the analytical framework drawing on theories of learning and use of knowledge in order to guide empirical analyses of the contribution of GEAs to policy discourses.

3.3 Understanding the contribution of GEAs to policy change by tracing changes in participants' story lines

This section builds on the theoretical considerations of Section 3.2. Based on an empirical analysis of seven GEA main objectives, and an empirical case study tracing some of the impacts of GEO-5 on policy discourses, it offers analytical tools to reconstruct how individuals from different participant groups in a GEA adapt contents from an assessment in their storylines. First, Section 3.3.1 explores how GEAs can impact discourses by tracing how they might inform and contribute to updating the policy story lines employed by three main groups of individuals actively involved in GEAs. Second, Section 3.3.2 offers an approach to systematically analysing, which ideas, stemming from a GEA, contribute to policy discourse. This approach relies on the identification of a key set of questions that GEAs can aim at responding to.

3.3.1 Methodological approach

The development of this framework relies on an inductive process that is based on two sets of empirical materials. First, it consists of the empirical material presented in Annexes B, C, D, F to this report, which includes 56 interviews with persons directly involved in the GEO-5 process, analysis of background documents, and workshop discussions with focus groups. The examples presented below are either extracted from the documents or the interviews. They do not reflect the interviewees´ personal evaluation of the GEO-5 assessment process, but were selected for illustrative purposes. An interview with a leading contributor to the IAASTD was also used.

In addition, official (scoping documents and assessment report prefaces and introductions) and semi-official (assessment websites) documents pertaining to the mandates, scopes, objectives, envisaged impacts, and organization of seven GEAs were analyzed. The seven GEAs analysed include the GEO-5, the MA, the IPCC, Working Group III Contribution to Fifth Assessment Reports (AR5 WGIII), the Global Energy Assessment (GEA), the IPCC Special Report on Renewable Energy Sources and Climate Change (SRREN), the Economics of Ecosystems and Biodiversity (TEEB) and finally the IPBES. Since the process of establishing the institutions of IPBES and deciding on their activities is ongoing, we focused on the description of the tasks of the platform and its foreseen activities (including a global assessment on biodiversity)

The main groups of actors that are more specifically analysed below were identified through document analyses of the seven GEAs, and their importance in shaping discourses was confirmed during the GEO-5 case study interviews. Furthermore, an illustrative set of questions that GEAs aim to answer, and which might provide arguments that inform discourses, was created in two methodological steps. First, we reviewed official (scoping documents, assessment report prefaces and introductions) and semi-official (assessment websites) documents pertaining to the mandates, scopes, objectives, and envisaged impacts of each of the seven

GEAs. The objective of this exercise was to identify a set of key questions that GEAs aim to answer. It does not mean that all of the objectives of each GEA were covered by the set of questions proposed below, nor does it mean that each GEA aimed to answer the whole set of questions. It only means that these questions have been important foci for at least two of the GEAs under review. Second, we collected empirical data on the GEO-5 and other assessments in order to illustrate how answers to these questions can constitute intellectual resources that participants of a GEA, in turn use to shape individual storylines.

The following section does not attempt to assess the magnitude of impacts or the effectiveness of the GEO-5. Instead, this case study aims at improving qualitative understanding and illustrating the channels through which a GEA may contribute to policy discourse. We not only analysed actually observed contributions to policy discourses, but also considered impacts that were envisaged as important *potential* contributions by the participants, disregarding whether these have been actually achieved by GEO-5 or other GEAs. We paid special attention that this distinction was clear throughout the text and in the use of examples. In addition, the respondents sometimes explained how certain ideas stemming from a GEA shaped the discourse of other actors who were involved more directly in the policy fora. We used this material as a source of information as well.

3.3.2 Tracing the influence of GEAs through the storylines of active contributors

While policy fora are defined as "the places where the individuals involved in epistemological communities, discourse coalitions, advocacy coalitions and the like interact in the generation of ideas," to which the definition of a GEA corresponds, policy arenas are, more broadly, "the places where policy actors with the power to formulate policy engage one another in a co-ordinative discourse, fed by the ideas of the fora" (Schmidt and Radaelli, 2004, inspired inter alia by Jobert, 1992; 1995). Thus, we can begin to trace influence by understanding what the participants in a GEA learned from the assessment process and how these ideas have fed the environmental policy stories they are telling.

As such, we focused on participants as the starting point to evaluate the influence of GEAs in policy arenas. Although we acknowledge that this restricts the scope of influence, we rely on Mitchell *et al.* (2006) and the fruitful work on tracing "productive interactions" between researchers and stakeholders (Molas *et al.*, 2011), as well as participatory impact pathways analysis (Douthwaite *et al.*, 2007) in order to assume that the influence of GEAs flows from the participation of individuals in both GEAs and policy discourses.

Importantly, the approach adopted here concentrating on active GEA contributors means that the role of the media and the actors involved in the broader outreach activities of an assessment are not explicitly analysed. The broadcasting of specific messages via media plays an important role in diffusing ideas in society and, subsequently, supports the formation of public opinion and public discourse, which are essential for making public policy decisions in democratic societies. The reason for this restriction is not that we believe the impacts of GEAs via the media are unimportant. Rather, analysing the media impacts of GEAs was outside the scope of this study, leaving this as an important task for future research, which may build on the conceptual and empirical analyses of this study.

This analysis defines a contributor as any person involved in the production of an assessment, whether in the scoping, production, or review stages. It may also include active participation in any meeting to which the person was invited to contribute. In our understanding, the category of contributors expands to the individuals, with a strong familiarity and proximity to the process (e.g. staff of the anchorage organization of the GEA) Here, we hone in on those participants that have contributed directly to the content development and shaping of GEAs (see Chapter 6 of this report for a more precise definition), thus complimenting the chapter on stakeholder engagement, which focuses on external stakeholders.

Illustrating the diversity of approaches, and relying on an analysis of the existing scientific literature at the time, Howlett and Bennett (1992) showed that the various strands of the learning literature are highly heterogeneous in terms of their focus on a variety of actors, from high-level officials to social processes involving most members of society. For instance, although they may not be considered explicit targets for GEAs, actors involved in epistemic communities (e.g., researchers) are important because they contribute to researching, structuring, and framing issues, which then become relevant to policy discussions (Haas, 1992).

In order to trace influence in policy decisions, it is necessary to look for evidence of learning and discursive use beyond the limited group of government officials, which is within the whole community of other actors who are working on policy-relevant issues and contribute to policy discourses. This is because the co-production of knowledge (Jasanoff, 2004) through iterative social learning processes (Haas, 1995; Social Learning Group, 2001) and feedback loops between policy learning, policy change, and policy networks (Pemberton, 2003) are crucial to the success of GEAs.

By reviewing the seven GEAs, and given our focus on active contributors, we identified three main groups across the whole community of actors that are working on policy-relevant issues (Howlett and Benett, 1992). They are internal stakeholders who may contribute to policy discourses in a crucial way. These categories are not defined based on the functions they exert in the assessment process (which may be multiple) but on the context in which they exercise their main functions outside of the assessment process.

The reason for this choice is that the context of the discourse partially shapes its content; that is individuals adapt the stories they tell to the audience they are talking to (Schmidt and Radaelli, 2004). Of course, these categories are ideal types, meaning they are neither exclusive nor exhaustive and are merely a starting point for tracing contributions to discourses.

We purposely exclude other types of contributors who could fall under the category of external contributors, such as the public, civil society, and other stakeholders, such as non-governmental organizations, representatives of civil society groups (women, indigenous groups, youth, and students) and industry (e.g., UN Major Groups). Such groups are not excluded because of their lack of importance, but to limit the scope of this study.

We rely on the empirical analysis we conducted on the GEO-5 to illustrate how the answers to core policy questions that GEA provide answers to can be taken up in the storylines of actors involved in the GEO-5 assessment processes. Examples are taken from the empirical analysis we conducted, particularly from the 56 interviews conducted with the GEO-5 participants.

The first considered group consists of the representatives of the institutions hosting the assessments. Although they may not be active in the initial production of the assessment in the sense of drafting the report, their responsibility over the process and familiarity with the outcomes suggests that they may be important ambassadors of the messages entailed in the assessments. Some of them may be involved in the organization of the assessment report(s) or even as authors (e.g., UNEP-DEWA for GEO-5).

The empirical analysis highlighted that the GEA may inform the discourses of these individuals through two important channels. First, they inform elements of the storylines these individuals are telling audiences outside their own organization, as. As such, UNEP's executive director, Achim Steiner, referred to the GEO-5 in multiple speeches on various occasions, as different as the Rio+20 conference, a conference on the post-2015 Agenda,[2] and a speech addressing international students at the Hertie School of Governance in Berlin in 2013.[3] Similarly, findings from the GEO-5 assessment report have been referred to in presentations given at the United Nations University.[4] Second, the ideas contained in an assessment may inform those discourses that directly pertain to changes in their own organizations and thus address those who have the power to act on these changes. As such, they may contribute to defining and orientating the activities of the anchor institution that produces it. This was exemplified by a comment in one of the interviews we conducted with a member of UNEP regarding the GEO-5: "The report on the state of the environment should identify the priorities which the organization. UNEP then internalizes in this planning strategic processes and so I think one of the goals that we'd always had was to be able to you know, influence the way UNEP develops its program of work."

The second group consists of researchers and experts who may be reviewers, authors, or contributors, depending on the specific roles they are given in each assessment. The storylines of members of this group may be affected by what they learned during an assessment. A researcher that we interviewed enthusiastically told us about some of the issues she learned about during the assessment process:

[2] Source: http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2013/03/18/connecting-poverty-eradication-and-environmental-sustainability-is-the-make-or-break-for-our-future/ Accessed on September 9, 2014

[3] http://www.hertie-school.org/de/media-events/veranstaltungen/events-pages/2013/23042013-lecture-and-discussion-with-achim-steiner/

[4] http://flores.unu.edu/wp-content/uploads/2013/11/03-Leonard-An-Integrated-Approach-for-Developing-Sustainable-Development-Goals-Relevance-to-Environmental-Resource-Management.pdf

> *"There is this series of emerging issues, like terms, that I never heard of, I, you know it seems stupid now, but at the time, I'd never, I didn't know what terms 'land grab, land grabbing' meant or what it was referring to or now 'water grabbing.' …I didn't understand what that was referring to and I couldn't have learned more about that if I hadn't spent time sitting with people from other countries that were affected by land grabbing and they were explaining the power dynamics to me."*

In the GEO-5, several interview respondents confirmed that such learning processes fostered collaborative research, generated new ideas, and fed policy briefs, showing that the assessment contributed to the subsequent framing of policy problems and solutions. In addition, some researchers involved in the GEO-5 assessment shared the lessons they learned beyond the academic community. "I am working and collaborating with farmers and farmer associations. So I spread also this information to them and now they are aware in what we published, what we released," explained another GEO-5 author from a developing country. Additional examples showed that the researchers and experts involved in an assessment that also act as policy advisors for their national governments, or work in research institutes or agencies under a Ministry also act as boundary agents between the assessment and their national policy arenas. As such, this group, as a whole, may play an essential role in strengthening and diffusing ideas within and beyond the assessment community.

Policy officers constitute the third considered group of participants. They may shape the mandate and scope of an assessment through their participation in the mandating plenary sessions of a GEA as a government representative and/or through the production of a summary for policymakers, for instance. Some may contribute to reviewing assessments, or they may be members of advisory boards (e.g., the GEO-5 Science and Policy Advisory Board; GEO-5 High Level Intergovernmental Advisory Panel).

The empirical analysis of the GEO-5 shows that these actors can catalyse policy learning in various ways, both at the national and international levels. For instance, some policy officers involved in the GEO-5 were intimately involved in the Rio+20 conference, which took place shortly after the release of the GEO-5 assessment report. Two out of the six policy officers we interviewed stressed the importance of the GEO-5 assessment process for the initiation of the Sustainable Development Goals. One of them said, "The issue of the Sustainable Development Goals were first thought and brought up on the table, as it were, during [the GEO-5] consultation processes that we were going through." In addition, the role of the policy officers as conveyors of ideas was crucial in the GEO-5 because they channelled the contents of the GEA to their national administrations. One policy officer involved in the GEO-5 process explained this process as follows:

> *"My colleagues in the ministry really, you know, continued the work that I started and so it was, it was sent to the minister she found it very interesting….There were some dedicated people within the ministry that, that pushed for it."*

Another policy officer reported,:

> *"I think I remember that, that some of these numbers we kept on using then afterwards also in our communications on environmental policy in [our country]…. [We have] a global outlook as part of our own assessment of the state of the environment in [our country] and that's for example where some of the information data and results of GEO-5 would typically fit in."*

In the last example, the policy officer presents two major avenues for GEO-5 knowledge production: communications on environmental policy and a national outlook for which the global information contained in the GEO-5 would provide a context. Therefore, the value that members of national administrations involved in GEAs attribute to an assessment process is a determining factor for how the policy ideas born within the assessment will influence discussions in policy arenas.

To conclude, because of the implications of their discourses beyond the assessment community, representatives of the institutions hosting the assessments, researchers and experts, along with policy officers, constitute three groups that actively contribute to using a GEA's collective intellectual resources to shape policy discourses. As such, they and the stories they are telling in various policy discourses can legitimately constitute the empirical starting point of an investigation regarding the contribution of GEAs to policy discourses.

3.3.3 To which elements of a discourse do GEAs contribute?

Tracing how ideas entailed in a GEA contribute to shaping policy discourses requires not only understanding *who* conveys ideas into policy discussions, but also *which* ideas travel. Howlett and Bennett's summary of the perspectives on policy learning in terms of "what people learn about" (1992) is too general for our purpose, as it applies to any type of policy learning. In the section below, we propose new analytical tools to better understand which kind of ideas the participants adopt from an assessment exercise.

In order to identify the nature of the ideas that a GEA generates and those that "speak to the soundness and appropriateness of policy programmes," which is an integral part of discourse (Schmidt and Radaelli, 2004), we review the official (mandating documents and assessment reports) and semi-official (assessment websites) documents describing the mandates, scopes, objectives, and envisaged impacts of each of the seven GEAs mentioned in the introduction to Section 3. In this exercise, we look for the questions that GEAs aim to answer and what answers are likely to constitute important arguments in discourses on environmental policies. We identify five core questions that seem to constitute important, but not exclusive, elements of a discourse that GEAs aim to inform (see Chapter 4, Table 4.2 for a broader list of questions that GEAs may address in order to inform public policy discourses). We explain each question in the following section, first by illustrating how they can be at the core of an assessment exercise, followed by an explanation of how they may inform discourses, using the empirical material we collected. At the end of the section, we shed light on capacity building as an indirect channel for influencing policy discourses.

What are the highest priority environmental and societal challenges?

One core activity of GEAs is to identify priorities for action. In some cases, this task is clearly indicated as one of the envisaged impacts of the assessment: "The [Millennium Ecosystem Assessment] is intended to be used to identify priorities for action."[5] In the GEO-5, the authors in charge of the second part of the assessment were tasked with answering the following question: "Which internationally agreed goals are high priorities for each region?"[6]

Although this envisaged impact and its related objectives are not systematically stated, as in the two examples above, other objectives related to the risk assessment and potential impacts of identified changes and pressures implicitly call for the provision of knowledge to support the setting of priorities in policy discourses. As such, the IPCC says its role is to "assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts."[7] This risk assessment may act as the evidence base that will help decision-makers set or readjust their priorities.

Two out of the five government representatives involved in the GEO-5 that we interviewed stressed the importance of prioritizing issues. The first emphasized the importance of the prioritization exercise in view of the approaching target year for the achievement of the Millennium Development Goals, as well as the development of a new set of targets at the international level:

> *"So prioritizing…was certainly one of the objectives…. The millennium development goals that were out there and were quite a successful tool of prioritizing certain topics, but they're not really covering very well the environmental dimension. So, we were hoping that through such focus on, on goals, on the environmental side, the [GEO-5] report could also be an input into the RIO+20 process into the whole discussions about…sustainable development goals, so this was all in the making."*

The other government representative stressed the importance of prioritizing national programs of cooperation with other countries: "Cooperating with other countries you need to know…where do we need to set the priorities….All this kind of information you really get from good quality assessment." For Ban Ki-moon,

[5] cosystems and Well-being: Current State and Trends, Volume 1, p. X

[6] Statement by the Global Intergovernmental and Multi-stakeholder Consultation on the Fifth Global Environment Outlook held in Nairobi from 29–31 March 2010 UNEP/IGMC.2 Rev.2

[7] Principles governing the IPCC Work, Approved at the Fourteenth Session (Vienna, 1–3 October 1998) on 1 October 1998, amended at the Twenty-First Session (Vienna, 3 and 6–7 November 2003), the Twenty-Fifth Session (Mauritius, 26–28 April 2006), the Thirty-Fifth Session (Geneva, 6–9 June 2012) and the Thirty-Seventh Session (Batumi, 14–18 October 2013).

[8] Source: preface of the GEO-5

the UN Secretary-General, the GEO-5 stresses the need to make environmental issues a higher priority on political agendas. As he articulated in his preface, the GEO-5 "underlines why world leaders need to show decisive leadership in Rio and beyond."[8] As such, the first aspect that GEAs can provide in discourses is stressing the relative importance of specific issues.

What are the appropriate environmental policy objectives?

This second core question, which relates to the appropriateness of specific environmental policy objectives, is echoed in GEAs through their evaluation of objectives and commitments to desirable futures. For instance, the Global Energy Assessment "evaluates future commitments to the reduction of GHGs, for example, to levels 20+ per cent below 1990 levels by 2020 and 50+ per cent by 2050, and negative emissions before 2100."[9] Similarly, the global assessment on biodiversity and ecosystem services, which the Convention on Biological Diversity Conference of the Parties called for at its 11th meeting and invited the IPBES to prepare, is intended to assess "the effectiveness of responses, including the Strategic Plan and its Aichi Biodiversity Targets. It is anticipated that [it] will contribute to the process for the evaluation and renewal of the Strategic Plan for Biodiversity and its Aichi Biodiversity Targets in general."[10]

At a conference on the role of environmental sustainability in the post-2015 development agenda,[11] UNEP's executive director, Achim Steiner, delivered a speech that illustrates how a GEA might contribute to policy discourse by framing objectives:

> *"UNEP's Global Environment Outlook 5 showed that of 90 internationally agreed environmental goals, only four are showing real progress. It is time to move from outcome to implementation…. The Post-2015 sustainable development agenda affords an inordinate opportunity to build upon and evolve the Millennium Development Goals to achieve a transformation that is not only catalytic, inclusive, and equitable but sustainable across the years and decades to come."*

In another speech, in which GEO-5 was not explicitly mentioned, Achim Steiner stated that the Sustainable Development Goals are "a comfortable way to hold the discourse of integration between economy, social and environmental issues"[12]. As a result, we can say that the GEO-5 is one element of UNEP´s storyline on the need to rethink and redesign international targets in a manner that better integrates environmental to developmental issues. In this specific example, the GEO-5 progress evaluation of internationally agreed environmental goals allowed UNEP's executive director to point out that there was a need to rethink and redesign the targets.

Are we on track to meeting our objectives?

The evaluation of the achievement of objectives is an important task that many GEAs aim to complete. The Global Energy Assessment "addresses climate change mitigation targets as outlined by the UNFCCC and other GHG mitigation initiatives," while the Millennium Ecosystem Assessment imagines that its findings will be used by international institutions (including the environmental conventions), national governments, the private sector, and civil society "to measure progress in achieving conservation and sustainable use objectives."[13]As far as the GEO-5 is concerned, providing "an assessment of the state and trends of the global environment in relation to internationally agreed goals such as those agreed at the Millennium Summit in 2000 and goals in Multilateral Environmental Agreements (MEAs)" was one of the major tasks outlined by the Global Intergovernmental and Multi-stakeholder Consultation.[14]

The fulfilment of this objective by the GEO-5 assessment process was highlighted in the GEO-5 press release. The message, which has been diffused, was that of unsatisfactory efforts made to achieve these objectives considering the fact that the GEO-5 "assessed 90 of the most-important environmental goals and objectives and found that significant progress had only been made in four." This exercise, captured by a report called *Keeping Track of Our Changing Environment*, a spin-off from the GEO-5 assessment process, was praised by two out of the five government representatives we interviewed for its ability to provide interesting and useful figures and data that were used in policy discussions. One of them said,

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[9] GEA website
[10] http://www.ipbes.net/work-programme/objective-2/45-work-programme/457-deliverable-2c.html
[11] Source: http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2013/03/18/connecting-poverty-eradication-and-environmental-sustainability-is-the-make-or-break-for-our-future/ Accessed on September 9, 2014
[12] Berlin Thüringische Vertretung
[13] Demand of funding from UNEP (implementing agency to the Global Environmental Facility) describing rationale , objectives, audience and use of the assessment. 2000, April 5.
[14] Statement by the Global Intergovernmental and Multi-stakeholder Consultation on the Fifth Global Environment Outlook held in Nairobi from 29 – 31 March 2010 UNEP/IGMC.2

"The one we have used quite a lot is the Keeping Track On Our Changing Environment, which was just one of the smaller reports in GEO-5 process, and that we've been using quite a lot. That's been useful." Another policy official said, "I also enjoyed the, the report on the global environmental targets, I thought they were useful to see how many there were and, and in which areas that was easy, more easy to reach them and [in] other areas [it was] not."

As these examples show, assessing the achievement of internationally agreed or nationally set objectives in a GEA generates intellectual resources, which support policy discourses.

What is the nature of the problems that have prevented us from attaining the existing policy objectives?

Identifying the nature of a problem is another core task of many assessments. The Global Energy Assessment "examines…the major challenges that all face in the 21st century, and the importance of energy to each."[15] The Global Intergovernmental and Multi-stakeholder Consultation of the GEO-5 considers the evaluation of the "major direct and indirect pressures and drivers of global environmental change" to be within the scope of the GEO-5, as well as reviewing "persistent environmental problems, emerging issues and opportunities, thresholds and tipping points to the Earth system."[16] Similarly, one aspect of the IPCC's mission, as defined on its website, is "to assess…the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change."[17]

The discussions we had with the interview respondents' revealed that the information provided on the nature of environmental problem in the GEO-5 have been used discursively. A government representative who was involved in writing the GEO-5 Summary for Policymakers mentioned that the analysis of the state and trends of the environment conducted in the GEO-5 had been important for generating a common understanding of "where we are at" on a regular basis, and that such an exercise may constitute a baseline upon which international negotiations could be conducted. Another government representative of the GEO-5 stressed that for him and his government, the GEO assessment process was:

"about trying…to come to a common view on what the problems are…. I really think it's one of the, one of the key functions…. It's the basis. If you don't know what's actually happening to your environment you will not be able to take the right kind of policy decisions."

He also said that such an analysis allows countries, especially smaller ones, to contextualize their national data in government documents. Yet another government representative told us "in particular, the drivers and the trends appeared to be of upmost use…. The findings, even before it was officially launched, were mostly used for the Rio+20 outcome document, The Future We Want." As such, identifying the nature of the problem is a third way by which GEAs can support policy discourses.

Which policy instrument combinations and institutional setups achieve different sets of objectives in the future?

As will be explained in Chapter 4, two types of sub-questions and related analyses can support this element of the discourse. The first set of questions focuses on existing policy options that have already been implemented and possibly evaluated in a specific context. They can be expressed as such: Which policy instrument combinations and institutional setups have actually worked to achieve a set of objectives in the past? Why did they work? What did not work and why?

The second question focuses on the potential options that may have the potential to achieve objectives in the future: Which policies might achieve different sets of objectives in the future? The answers to each of these questions lie in identifying the promising policy ideas and potential options for action.

[15] Source: Preface, pp. XII.
[16] See note 12.
[17] Principles governing IPCC Work, Approved at the Fourteenth Session (Vienna, 1–3 October 1998) on 1 October 1998, amended at the Twenty-First Session (Vienna, 3 and 6-7 November 2003), the Twenty-Fifth Session (Mauritius, 26–28 April 2006), the Thirty-Fifth Session (Geneva, 6–9 June 2012) and the Thirty-Seventh Session (Batumi, 14–18 October 2013).
[18] Statement by the Global Intergovernmental and Multi-stakeholder Consultation on the Fifth Global Environment Outlook held in Nairobi from 29 – 31 March 2010 UNEP/IGMC.2 Rev.2
[19] http://report.mitigation2014.org/drafts/final-draft-postplenary/ipcc_wg3_ar5_final-draft_postplenary_chapter15.pdf

All seven of the GEAs identified and analysed various policy options. A key question of the MA is which "strengths and weaknesses of response options…can be considered to realize or avoid specific futures?" The GEO-5 assessment is one of the few assessments from our sample that addresses, rather directly, the method *ex post* by which the review of policy options should be conducted and dedicates an important part of its assessment report to this exercise: "the following objectives for the [GEO-5] report and process are adopted: To strengthen the policy relevance of GEO-5 by including an analysis of case studies of policy options…."[18] This is accompanied by a chapter on global responses. The GEO-5 is not the only assessment that reviews national policies, since the IPCC Working Group III Assessment Report also includes a section on "national and sub-national policies and institutions" (IPCC, 2014).[19] The method by which these questions were dealt with, their evolutions, and the consequences of such choices are discussed elsewhere in this book (see Chapters 2 and 4). The scientific literature confirms the importance of the answer to this question for policy discourse. When a GEA takes the function of a forum where the prospects and costs of ratifying and complying with existing protocols are discussed (Vandeveer, 2006), it can contribute to reducing concerns about the economic implications of a measure (Farrell and Keating, 2006; Vandeveer, 2006) and provide arguments and intellectual resources for policy actors to argue for specific options (Shulock, 1999; Patt, 2006). In this way, GEAs may introduce new or unpopular option(s) into policy discourses, or remove options (Parson, 2006).

The interviews we conducted with GEO-5 participants highlighted several real and expected contributions to policy discourse. One experienced contributor to the GEO-5 said "I know that through some of my work in the South Pacific that those governments have referred to it…. I think most governments want to see how policy or how change is brought about in different contexts, so I think that's how it was used." This respondent also said the GEO-5 contributed to policy discussions on the implementation of treaties: "I know that in working groups on the implementation of treaties, on addressing different issues, such as biodiversity loss, climate change, I know that in working groups, I had discussions and dialogue where people have referred to it." Interestingly, a government representative from a developed country emphasized the GEO-5 as a source of information for developing policies of cooperation with developed countries:

> *"It wouldn't surprise you that for us the, the policy options are most relevant…so what can we do in [our country], can we learn from others?... It also changed or informed our development cooperation policies with regard to environment… so what can we do, internationally, is to support a number of these ideas on the ground, of course in close cooperation with, with individual governments in the, in the global south."*

The words of another policy official complemented this view: "I mean, cooperating with other countries you need to know…what is working, what isn't working, all this kind of information you really get from good quality assessment." Similarly, the empirical material we collected on the IAASTD proved that it was used often discursively to support policy discussions on rights and access to food.

As a result, this last core questions about policy options can also offer sources of information for policy discourses.

An indirect contribution to policy discourse: building capacities for more specific assessments

In addition to directly providing intellectual sources for policy discourses through answers to fundamental questions that underline environmental discourse, assessments may contribute to inspiring the creation of more thematically specific and regionalized assessments. The empirical analysis of assessment mandates shows that for many, capacity building constitutes one of their main missions. The MA, the GEO-5, and the assessments of the IPBES emphasize capacity building as a core objective of their enterprise.

The empirical material we collected on the IAASTD showed that training people from various countries to conduct assessments was one main reason to conduct the IAASTD. These participants would go back to their countries of origin carrying with them the knowledge and the capacity to adapt the recommendations entailed in the IAASTD to their country.

Although building capacities does not directly inform policy discourse, the contribution of assessments for building capacities should not be neglected. Basing its conclusions on the case of India, Biermann (2001) shows that the lack of influence of global assessments

in the South results from the lack of consideration of the socio-economic context in which these countries are embedded, of the particular situation of developing countries, and the technological and climatic differences that exist within the North. Similarly, Cash and Clark (2001) pinpoint the lack of appreciation of the context, the lack of consideration of the needs, concerns, and capacities of potential users (especially at the local and national levels), and the lack of connection between local and global levels as major obstacles to the success of the Global Biodiversity Assessment.

Considering these critiques, the role that they play in terms of inspiring assessments on more specific issues and contexts may be seen as complementary to their global approach. Consequently, an assessment may be particularly successful at building capacities within specific communities and, as such, may support the production of knowledge in more localized contexts. This requires scientists to gain broader understandings of issues across scales, disciplines, and sectors and to gain knowledge about methods and analytical tools (Ranganathan *et al*., 2008). As such, capacity building prepares the ground to answer these questions in specific contexts.

Supported by the high number of authors in our sample of interviewees, we can say with assurance that the GEO-5 strongly contributed to capacity building on two levels. First, the GEO-5 served as a role model for the design of more targeted environmental assessments. Assessments and monitoring initiatives in Eastern Europe, the South Pacific (e.g., Sri Lanka), Latin-America, the Caribbean, Africa and, in particular, South America and China were mentioned as having been influenced by the GEO-5 procedures and methodologies during the interviews. Similarly, the Austrian Panel on Climate Change (APCC) was directly inspired by the IPCC and the structures of its reports are based on those of the IPCC. In addition, insights from the GEO-5 and its related reports have fed into national capacity building trainings at environmental agencies:

> *"When we have this specific capacity building training course here at the environmental agency here in S.[20], we use this as part of the training. People [from] other agencies, either from Europe but also from, from China and India are visiting our environmental agency for trainings."*

Furthermore, one interviewee stressed that his experience with the GEO-5 helped him contribute to a city-level assessment report on climate change in Asia.

Second, the GEO-5 process contributed to building capacities within the scientific community from a content perspective, as well as a methodological perspective, through the methodological expertise acquired by the participants during the assessment process and the related training modules. The majority of participants reported having transferred this knowledge to their students, if not to colleagues or other stakeholders. One interviewee said

> *"They trained us as trainers for UNEP in the area of integrated environmental assessment and this helped us a lot in impacting the policies in the region. Why? Because we have, we are post-graduating university, we have a lot of students that are implementing the methodologies that have been developed by UNEP and which has a part of policies and international agreement and we implemented their thesis and their work and even the research of their staff, so we are working together, they enhance us…. I used the methodologies…analysing our policies and to recommend new policies… to serve our environmental problems…. I am teaching this, I have courses in environmental indicators and integrated assessments, using the methodology that I have learned in GEO process and having students working and thinking like and like GEO, this is achievement for us, for our region."*

In addition, several authors mentioned the personal benefits of participating in the GEO-5, such as fostering new collaborations, and catalysing learning across and within countries, fields, and disciplines. They reported having acquired a better understanding of the context of their research and learned how to frame their research in a way that was more relevant to policy and society. This contributes to the effectiveness of the science-policy interface and to more policy-relevant framing of research. Finally, the GEO-5 was referred to as an encyclopaedic type of document to which various target audiences (including students) could turn to inform themselves about the state of the global environment.

[20] Anonymized location of the training

Because of its focus on drivers and policy options, and its assessment of the achievement of internationally agreed-upon environmental goals, the GEO-5 has fostered learning and contributed to all of the elements of the discourse presented above.

To conclude, we were able to demonstrate that the contribution of an assessment to policy discourse can be understood by tracing how information provided by the GEA was used by individuals to construct storylines. Four important questions have been identified in seven GEAs. They relate to the identification of priority challenges and appropriate objectives, the achievement of internationally agreed objectives, the nature of the problems that hinders the achievement of those objectives, and the identification of promising policy options.

An additional indirect pathway toward informing policy discourse emerged from the analysis: the ability of GEAs to build capacities, especially in developing countries. While this analysis does not claim to provide an exhaustive list of the potential contributions that GEAs can make to policy discourses, it illustrates some important dimensions in which this has taken place.

3.4 Discussion and conclusion

The benefits of the discourse approach to analyse the influence of GEAs

Applying the basic principles of discourse analysis to the impact analysis of GEAs is useful for helping to bridge the gap between micro-processes at the individual level, in terms of learning and the use of knowledge, and the structure or agency level, in terms of the institutional changes to which they contribute. An analysis of the contribution of a GEA to the story lines told by the participants offers a first step towards understanding how ideas travel from a GEA to national and international policy arenas. It is useful to trace and understand some of the mechanisms by which individual learning in a GEA contributes to spreading the elements of a discourse within and beyond a discourse coalition.

An ongoing preliminary analysis of the contribution of the GEO-5 to international discourses seems to indicate that it contributed to discussions on the post-2015 development agenda and the process of developing a set of Sustainable Development Goals. It also provides insight about the fact that the value of a GEA can be more tacit than explicit. Although, the summaries of the preparation for the Rio+20 conference does not reveal that the GEO-5 was discussed extensively, interviews with participants of the GEO-5 and the Rio+20 conference suggested that the GEO-5 played an important role in shaping their ideas on the Institutional Framework for Sustainable Development and the Sustainable Development Goals.

We hope that this description of the variety of channels by which a GEA can contribute to shaping discourses will help assessment-makers and contributors to better appreciate the subtle influences of the GEA process.

Application of the framework: methodological reflections

The framework for empirically analysing impacts of GEAs developed in this chapter can be applied in two ways: First, by taking into account a large array of contributors, such analyses may reveal which content-related aspects of the GEA have caught the attention of policy makers, and in which policy arenas. By tracing how participants use key policy questions-related type of information that GEAs provide, this approach could also help to initiate and structure a systematic comparison of the influence of several assessments. Second, further research may look into whether some assessments have been particularly successful at supporting specific elements of a discourse. In such a case, we would need to select a policy arena and investigate thoroughly the contribution of the GEA to a specific discussion using the participants' story lines (and ideally changes in these storylines after they engaged in the GEA) and the set of questions presented above. Investigating how the GEO-5 has contributed to the discussions on the Post-2015 Development Agenda could be such an example.

The first type of application would help assessment-makers to better understand the strengths and weaknesses of an assessment, while the second type of application would contribute to better understanding the specific contributions of a GEA to policy discourse, especially its collective dimension. This would bridge the gap between understanding the contributions of GEAs to individual story lines and collective discourses. While this work has uncovered a diversity of contribution pathways, further work is needed to describe and qualify more precisely the discursive roles of assessments and the GEO-5 in terms of the multiple specific policy arenas that they have informed. Exploring how individual narratives flow into collective

discourses is a critical point that requires further investigation.

Limitations and avenues for further research

Empirically tracing the individual learning outcomes and discursive uses of knowledge generated by GEAs through interviews with individuals is challenging. Often, it was difficult for the interviewees to identify and extract what they had learned from the GEA from other sources of information. Their statements are broad and relatively unspecific, which makes it difficult to investigate exactly how the GEA contributed to supporting a specific story line. Nevertheless, it unveiled the variety of actual and potential contributions of a GEA to policy discourses.

By focusing on the analyses of the discourses that emerged from the GEAs and the anecdotal evidence related to personal experience, this approach runs the risk of over-emphasizing the positive contributions of the assessments while neglecting their weaknesses and missed opportunities and, thus, the identification of pathways for improvement. Discussing the envisaged impacts, rather than only actually attained impacts and their achievements, as perceived by the participants is one way to approach this challenge empirically. As such, even when respondents were able to identify contributions to policymaking, they often expressed criticism regarding the lack of precision of some sections of the report. Asking questions about the achievement of the objectives and envisaged impacts of the GEO-5, as well as the ability of the assessment to be relevant to all decision-making levels revealed a large array of sometimes contradictory expectations that the interpretation of the mandate of the GEO-5 generated among the participants and target audiences. Some stressed the lack of analysis of an "overall picture," which underlies the need to better connect the various issues that the GEO-5 covers, thus emphasizing the analysis of the interlinkages between them. Conversely, other respondents insisted on the need to provide more detailed case studies that are relevant to specific national contexts, "rather than a very general global picture" and to invest more in targeted products.

A broad sense of agreement about the over-ambition of the GEO-5 was shared among the consumers, target audiences, and authors of the GEO-5. Several coordinating lead authors reported difficulties in implementing the guidelines contained in the scoping documents and those supported by the mandate. Because of the lack of precision of these guidelines and the lack of time available to specify them, the coordinating lead authors were left with a large range of possible interpretations of their tasks and a wide variety of potential roads to go down. In particular, analyzing the multiple issues tackled by the GEO-5 across multiple jurisdictional and biophysical scales, as well as finding a coherent style that was suitable to the multiple target audiences of the main report, were also reported as main challenges. Nine out of the 13 coordinating lead authors whom we interviewed felt that subsequent iterations of the GEO would benefit from a shift in focus, for instance by narrowing the scope, be it in terms of scale, target audience, objectives, or a better distribution of the findings across several assessments.

Finally, this chapter has not tackled the question of how to quantify the magnitude of these contributions, which would certainly be an interesting complementary perspective to this work.

Lessons learned to improve the next iteration of the GEO

When asked about impacts, the initial spontaneous reaction of the interviewees was often one of regret because the GEO-5 did not have more impact in policy spheres. However, a number of examples emerged when discussing the learning outcomes, the use of the assessment findings to support speeches, policy discussions, and the reproduction of the assessment procedures and methods in other contexts. Thus, the feeling that the assessment had too little impact seemed to have been partially caused by a lack of acquaintance with policy processes, a partial view on the outcomes and/or unrealistic expectations. Nevertheless, comparing the envisaged impacts to those that were actually achieved reveals a noticeable discrepancy. Moreover, a lack of joint understanding of what an assessment ought to achieve in terms of impacts may constitute an important misunderstanding that can potentially complicate the complex process of carrying out an assessment and, thus, could potentially reduce its ability to inform discourses.

In order to avoid this, the assessment process should be preceded by a collective discussion among the authorized parties or recipients of the assessment, as well as the producers and experts tasked with leading the content development. This discussion should first clarify the core audiences targeted by the assessment. Usually, strategies target major groups, but they could go one step further to define more precisely the types

of communities targeted and add an extra level of detail to identify the existing policy arenas that the assessment could inform. The properties of policy arenas frame policy demands and interests in terms of specific types of knowledge. For GEAs to provide the relevant intellectual resources to frame discourses in policy arenas, their contributors need to be aware of their properties. The Rio+20 conference was one such policy arena that the GEO-5 has targeted. The Post-2015 Agenda and the Sustainable Development Goals are others that could be targeted in the future. Similarly, a close collaboration with relevant stakeholders and government representatives in particular could help to identify relevant policy arenas at the national and international levels if this were an objective of the GEA.

Second, as the exercise of formulating the questions above has shown, the multiplicity of entry points for environmental issues requires GEA producers to prioritize the issues to be addressed based on the resources available, in order to avoid spreading resources too thin and, thus, ensuring the quality of the assessment. Such an exercise should clarify the envisaged impacts and related objectives of the GEA. Subsequent decisions should be clearly communicated to all of the contributors and drive the entire assessment process. Ensuring the connection between the intellectual resources produced in the professional forum and policy arenas is essential for actors to produce efficient discourses (Fouilleux, 2004). Identifying more precisely what policy arenas can be informed by a GEA would help GEA producers to implement the recommendation by Mitchell *et al.* (2006) that GEA practitioners and assessment producers should make "conscious efforts" to make these assessments relevant, credible, and legitimate to the multiple audiences they target and their particular characteristics.

Clarifying the scope of the communities targeted and how their demand for intellectual resources will be addressed is also crucial because it influences how and through which channels the products will be developed and distributed. If the scientific community working on policy-relevant issues ought to be one of the main target audiences, then focusing on research gaps related to inter-linkages or *ex post* policy evaluations, for instance, may be an interesting strategy (see Chapter 4).

Selecting the policy questions to be addressed and the policy arenas to be targeted requires collaborative work with the relevant actors. The format of the early scoping meeting or the consultation with stakeholders could be aligned with this objective (see Chapter 6). For instance, the IPBES launched a survey with the Secretariats of Multilateral Environmental Agreements, governments, and various stakeholders to determine their specific knowledge needs. The results of this survey contributed to the prioritization of the issues to be addressed by the platform, by way of assessments. This procedure may be worth considering for the prioritization of issues to be addressed and arenas to be targeted in the GEO-6, but this would have to occur early in the process in order to ensure reasonable expectations of the GEA process as well as to have a real impact on the determined scope of the assessment.

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Chapter 4

Public policy assessment in GEAs

ABSTRACT

The aim of this chapter is to review and conceptualize the promises, challenges, and response options for conducting public policy assessments (PPAs) in the context of solution-oriented global environmental assessments (GEAs). Solution-oriented GEAs that focus on PPAs differ from problem-oriented GEAs because they focus predominantly on providing knowledge about specific policy options, which policymakers can choose to adopt in the context of existing policy processes. Beyond the basic benefit of enhancing the quality of public policy discourses, the distinct promises of PPAs in GEAs as *global* enterprises include (1) supporting international policy regimes, (2) facilitating the global diffusion of policy lessons, and (3) supporting environmental policy agenda-setting processes on multiple scales. The key challenges to PPAs in GEAs include the fundamental complexity of the domain of international environmental governance (IEG), as well as the prevailing research gaps, pervasive uncertainties, and disputed normative implications of PPAs. Possibly response options include an improved conceptualization of PPAs for guiding and coordinating these exercises; carefully focusing their scope and objectives in alignment with the available resources (e.g., time, funds, and expertise); and investing in expanding PPA-related capacities of future GEAs, such as by building related research communities in the social sciences and humanities. The chapter proposes a meta-level conceptualization for PPAs in GEAs to foster discussions on this topic.

Key Messages

1. Public policy assessments (PPAs) in solution-oriented GEAs offer an opportunity to enhance the quality of public policy discourses and resultant policies.

2. PPAs in GEAs, employing a distinctly global scope, provide three opportunities: (1) to inform and potentially facilitate deliberations over and the implementation of global and international policy regimes; (2) to facilitate the diffusion of domestic policy lessons and related collective learning processes across regions and, sometimes, disputing stakeholder groups; and (3) to support environmental policy agenda-setting processes by initiating more explicit, systematic, and rational public discourses.

3. To realize these benefits, PPAs must adopt strategies to respond to several fundamental challenges: the complexity of the domain of IEG; the prevailing research gaps in various policy options; the pervasive uncertainty of policy-related knowledge; and the disputed normative implications of such research. In addition, the absence of a broadly accepted meta-conceptualization of PPAs in GEAs continues to hamper their design and conduct.

4. A broadly shared explicit meta-conceptualization of PPAs in GEAs would facilitate their coordination in the future. The chapter proposes such a conceptualization that emphasizes (1) the opportunities of an PPA approach that explores and maps alternative future policy pathways that are informed by systematically derived ex post policy lessons; (2) multiple objectives, scales, and actor groups that need to be considered in such assessments; and (3) the variety of public policy questions that GEAs might respond to by drawing on diverse approaches and methodological expertise available.

5. GEAs must carefully align their scopes and objectives to the limited resources typically available (e.g., expertise, time, funds) and manage the tradeoff between being comprehensive and broad versus being more narrow but deep.

6. Investments in the development of the various research communities (including the social sciences and humanities) that address the policy questions raised by GEAs would advance their ability to execute PPAs. GEAs can contribute to such capacity-building efforts by identifying gaps in knowledge and by leveraging existing partnerships, networks, and centers of excellence to engage a broader range of experts.

4.1 Introduction

This chapter aims to review and conceptualize the promises, challenges, and response options for conducting PPAs in the context of solution-oriented GEAs. This has become increasingly relevant in recent years as the demand for solution-oriented analyses, including formalized assessments of public policy responses to global environmental challenges, seems to have risen (see Chapter 2; Hulme, 2010; Schiermeier, 2014). Hardly any literature discusses the fundamental conceptual and methodological challenges of conducting PPAs within GEAs explicitly and systematically. As this lack of knowledge seems to be hampering the development of solution-oriented GEAs, this chapter aims to contribute to closing this gap and to thus foster discussions about enhancing the effectiveness of future PPA exercises within and outside of GEAs.

Solution-oriented GEAs that focus on PPAs differ from problem-oriented GEAs because they focus predominantly on providing knowledge about specific policy options that policymakers can choose to adopt in the context of existing policy processes. Problem-oriented GEAs focus on establishing and enhancing the understanding of the basic natural and social processes that lead to adverse environmental changes, such as drivers, pressures, states, and impacts of environmental change. PPAs in GEAs need to systematically build on and integrate such problem-oriented knowledge in order to ensure that the solution strategies match the problem structures and are effective. However, compared to problem-oriented assessments, PPAs focus on understanding how—given the often imperfectly understood problem structures—institutions and policy instruments that are, at least in principle, at the disposal of policymakers and broader societal decision-making processes can alter relevant human choices (e.g., in economic production and consumption) so as to achieve certain policy objectives. The public policy objectives that might be considered in GEAs include those that are currently being deliberated in the emerging set of SDGs, which promise to offer a broadly shared entry point for future PPAs in GEAs.

This chapter proceeds as follows. Section 4.2 introduces the employed methods. Section 4.3 reviews the potential benefits of PPAs in GEAs, while Section 4.4 identifies the key challenges. Section 4.5 discusses the potential response strategies to these challenges in three steps: First, a theoretical conceptualization of PPAs in GEAs is proposed. Second, various options are discussed are discussed to align the objectives, means, and policy discourses to which PPAs in GEAs contribute. Third, options for expanding the policy assessment capacity of future GEAs by developing relevant research outside of formal GEA processes are considered. The chapter concludes by summarizing the main arguments and recommendations.

4.2 Methods

The analysis in this chapter is based on multiple methods. First, conceptual argumentation is employed to advance establishing an explicit and broadly shared conceptualization of PPAs in GEAs. Second, a literature review was conducted. The considered literature includes analyses of GEAs, particularly the work conducted within the Global Environmental Assessment Project (Jasanoff and Martello, 2004; Farrell and Jäger, 2005; Mitchell et al., 2006), the Social Learning Group (2001a, b), and by various others (such as Watson, 2005; NRC 2007). The literature most closely related to this article offers reflections and analyses on policy assessments in GEAs from broader, systematic (Morgan et al., 1999; Norgaard, 2008), and more specific perspectives that focus on certain approaches and methods, such as integrated assessment modeling (van Vuuren et al., 2011) and multi-objective assessments (von Stechow et al., 2014). The literature on the use of knowledge in international relations (e.g., Haas, 1992; Haas, and Mitchell, 2013; Haas 2014; Keohane and Ostrom, 1995) and on the role of knowledge and learning in domestic public policymaking (e.g. Bennett and Howlett, 1992; Radaelli, 2009) are also relevant but they focus less on the methodical and applied "technical" aspects of policy assessment than this chapter does. Other relevant strands of literature discuss the alternative conceptual foundations of public policy analysis and policy design, usually in national and sub-national policy contexts, and draw on political science and economics concepts (e.g., various conceptualizations offered by Howlett, 2011; Dunn, 2011; Fischer, 2003; Stone, 2012). These studies do not deliberately relate to the global dimension of GEAs and treat environmental policies as one of several fields of application. By contrast, some studies deliberately focus on public policy methodology issues in specific global environmental policy domains (e.g., Mitchell, 2008; Robert and Zeckhauser, 2011; Aldy and Pizer, 2014) and are, thus, closely related to the questions addressed in this chapter, even if they do not reflect these issues specifically in the context of GEAs. Document reviews and analyses also informed the

research in this paper. The materials considered include GEA background documents, scoping papers, meeting reports, independent evaluations, official United Nations documentation, government reports, news articles, and, of course, the assessments themselves.

Third, a total of 80 semi-structured interviews with GEA participants were conducted, 67 of which participated in the GEO-5 process (see Annex B). The interviews were coded (using MAX QDA) and analyzed with respect to the statements the interviewees made in view of the policy assessment elements within the GEO-5 and other GEAs.

Fourth, discussions at two FOGEAM workshops on the GEO-5 process—one with UNEP staff involved in GEO-5 in Nairobi in August 2013, and one with 19 CLAs and other authors engaged in the GEO-5 that took place in Berlin in October 2013 (see Annex B)—contributed to informing the analysis in this study. Fifth, reflections on the chapter authors' own experiences with PPAs were important. Finally, multiple informal conversations with members of the GEO-5 production team, as well as the Technical Support Unit staff and authors who contributed to the IPCC AR5 WGIII, helped to orient and calibrate the analysis of this chapter.

4.3 Potential benefits of PPAs in GEAs

The main potential societal benefit that might be expected from including PPA elements into GEAs is that they can improve knowledge on relevant policy questions within ongoing policy discourses (see Chapter 2). Reliable and high-quality policy knowledge provides an adequate understanding of policy instruments and institutions and how these are projected to impact complex coupled systems – under conditions of uncertainty – with a view towards the realization of various policy objectives (such as wealth, provision of food, energy, health, etc.). Improving the reliability of the knowledge underpinning the design and operation of public policies should enhance the quality and effectiveness of policymaking in the sense that it increases the likelihood that the policy objectives are actually achieved. Most other forms of knowledge, such as casual observation and ad hoc reasoning, are less likely to have this property. Also, as systems and policies continuously change and evolve, policy knowledge needs to adapt and requires continuous updating in view of these changes. Ideally, PPAs in GEAs can contribute to continuous, systematic, and reflexive individual and societal learning and deliberation processes that enhance the quality of public policy responses to societal challenges related to global environmental change and sustainability (see Chapter 3).

While policy analysis and policy design studies are a relatively well-established field within several scientific disciplines at the national and sub-national levels of policymaking, a distinct question is why environmental policy assessments must be conducted at the *global* level, such as within GEAs. Three opportunities emerge from the adoption of a global scope of analysis (and a global process) for conducting PPAs. First, if tackling global environmental problems requires some form of multilateral policymaking or policy coordination at the global or international level, establishing a shared perception of both the problem situation and the available global or international response options via a PPA is one important prerequisite for effective policy implementation and coordination (e.g., Haas, 1992; 2014). For example, an assessment of experiences with the Kyoto Protocol might be useful for informing deliberations over the future of the global climate regime. An assessment of these policies and coordination mechanisms promises analogous benefits when a global regime is constituted by the coordination of domestic policies rather than a specific global or international instrument (Aldy and Pizer, 2014).

Second, as sub-global jurisdictions (e.g., nation states, federal states, cities) increasingly adopt public policies for tackling global environmental problems, there seems to be a larger scope for systematic learning from and diffusion of experiences made in such domestic policy experiments. This not only benefits stakeholders in jurisdictions and countries that are lacking policy analysis capacities (Aldy, 2014); it can also facilitate comparative analyses and the diffusion of the most recent lessons from domestic policy experiments among stakeholders in countries with more advanced PPA capacities (Dolowitz and Marsh, 2000; Gilardi 2012).

Third, and cutting across the two previous arguments, the inclusion of PPAs in GEAs promises to support and inform international and domestic environmental policy agenda-setting processes (Haas, 2014). The conduct and release of GEAs that incorporate PPAs can stimulate public and expert debates over the policies and institutions considered (and those not considered). As much as GEAs introduce and establish certain quality standards of public policy discussions, including building the capacities of participating

researchers and other stakeholders, they also promise to enhance the quality of these discourses.

One practical consequence of these considerations is that they may be designed deliberately to achieve only one or several of these potential benefits. We revisit this point later, but more research is required to better understand the contexts and conditions that would suggest focusing on one type of benefit over another.

Whether these potential benefits can be realized empirically depends on how the challenges of public policies—discussed in the next section—are dealt with. In general, the likelihood of realizing one or several of these benefits is an empirical question that can only be answered by empirical GEA experiments (including a systematic *ex post* analysis of these), rather than on a theoretical *a priori* basis.

4.4 Challenges to public policy assessment in GEAs

In delivering on the promises outlined in the previous section, PPAs within GEA processes need to adopt strategies for responding to various challenges. The first of these is the inevitable and *fundamental complexity* in the domain of IEG. To illustrate this basic point, **Table 4.1** provides an example of the potential analytic dimensions that may be considered in PPAs in GEAs. The table does not claim that the categories or dimensions are comprehensive; however, it demonstrates that assuming a multiplicative relationship with the potential dimensions of categories to be considered and specified in PPAs easily yields a multi-million-dimensional space that is not easily or comprehensively analyzed within a GEA.

Second, there is currently a lack of peer-reviewed policy research that is readily available for review and synthesis for many of the policy questions that solution-oriented GEAs aim to address. This is illustrated by the participants' experiences with the GEO-5 and IPCC AR5 WGIII processes as revealed in the FOGEAM interviews and workshops. A major policy-related objective of GEO-5 was to "strengthen the policy relevance of GEO-5 by including an analysis of case studies of policy options, that incorporates environmental, economic, social and scientific data and information and their indicative costs and benefits to identify promising policy options to speed up achievement of the internationally agreed goals such as those agreed at the Millennium Summit in 2000 and in Multilateral Environmental Agreements" (UNEP 2012). Among the main challenges that the GEO-5 authors experienced and reported in the interviews was a lack of available (peer-reviewed) literature to inform an exercise responding to this task, especially in developing countries. In a similar vein, the IPCC AR5 WGIII Chapter 13 titled "International Cooperation: Agreements and Instruments" reports:

> *"Gaps in knowledge and data [exist with respect to]: (1) comparisons among proposals in terms of aggregate and country level costs and benefits per year, with incorporation of uncertainty; (2) assessment of the overall effect of emerging intergovernmental and transnational arrangements, including 'hybrid' approaches; (3) understanding of complementarities and tradeoffs between policies affecting mitigation and adaptation; (4) understanding how international cooperation on climate change can help achieve co-benefits and development goals, including capacity building approaches; (5) understanding the factors that affect national decisions to join and form agreements."*

That is, despite a significant increase in overall publications on climate change (Grieneisen and Zhang, 2011), IPCC authors identified significant gaps in knowledge in systematic comparative *ex post* assessments of policy instruments and institutional settings for climate policy at the international level. Similar arguments can also be developed for climate policies at the national and sub-national levels (Schiermeier, 2014; Edenhofer and Minx, 2014).

A third challenge, which is analytically distinct from the previous ones, is the uncertainty regarding much of the knowledge that is available on environmental policies. Uncertainty further increases the complexity of the environmental PPA domain. GEA strategies to deal with uncertainties have been the subject of research in the context of the IPCC, including in the more policy-oriented WGII and WGIII (Mastrandrea et al, 2011). Some of what may be considered good practice for GEAs has been developed in the context of the IPCC, such as multi-model and multi-scenario analyses of future business-as-usual and policy pathways using integrated assessment models (IAMs) (IPCC 2014; UNEP 2013). These good practices should be adopted and developed further in emerging GEAs and in research informing these.

Table 4.1. *Illustration of the high-dimensionality of International Environmental Governance as the domain of public policy assessments within GEAs*

Category (examples)	Potential Specifications (examples)	Dimensions (example)
Time	Ex post, ex ante	2
Scale	Municipality, State, Nation, Region, International	5
Systems	Multiple natural, technological, economic, political systems and sectors, interactions, etc.	10
Actor groups	Government, business, civil society, consumer groups, income groups, etc.	5
Policy objectives	Single, multiple, interactions, etc.	5
Welfare functions	Utilitarian, Rawlsian, …	2
Social system problem diagnosis	Incomplete knowledge, collective action dilemma, normative positions, etc.	5
Policy instruments	Single, multiple; environmental, all relevant (incl. macroeconomic)	10
Policy instrument Interactions	Ceteris paribus analysis, instrument interactions, etc.	5
Methodologies	Case study, comparative (per region, per instrument), theoretic, participatory, etc.	5
Illustrative total		**6.250.000**

A fourth challenge for PPAs in GEAs is the presence of divergent viewpoints in the analysis and discussion of public policy options, as discussed in Chapter 5. Divergent viewpoints can have several sources, but the existence of uncertainty, different value systems, and the self-interest of agents are key factors. Several interviewees indicated their doubts that national governments would be willing to have their domestic policies critically assessed by a GEA. The relevance of this point is also underpinned by the difficulties experienced in the adoption of the summary for decision-makers for the IAASTD assessment, and by the IPCC AR5 WGIII Summary for Policymakers (SPM) plenary meeting in Berlin in April 2014. During that meeting, the inclusion of figures that would have indicated historic CO_2 emissions disaggregated by country groups' World Bank income level proved highly controversial. No consensual government approval for the figures was achieved and they eventually had to be removed from the final version of the SPM. Therefore, they are only displayed in the technical summary and the underlying report, as well as in the perspectives published in *Science* magazine, which featured three scientific author perspectives on the incident (Edenhofer and Minx, 2014; Victor et al., 2014; Dubash et al., 2014). Several participants and observers interpreted this incident as reflecting the concern of some governments over deviating from the UNFCCC country grouping—i.e., distinguishing Annex-I from non-Annex-I countries—in the IPCC context. Adopting World Bank classifications might have been perceived to set a precedent for future UNFCCC negotiations, including the classification of countries in a potentially novel climate regime, which might have implications for the allocation of rights and responsibilities based on country groupings. Thus, changing the country classification system might have been perceived to potentially alter some countries' bargaining positions within the UNFCCC negotiations. This case offers at least two lessons: First, even a merely descriptive *ex post* indicator-based analysis without reference to policy goals can lead to intense politicization of the GEA process, and there can be multiple disputing perspectives on how to accurately describe the past. Second, the definitions and concepts adopted within GEAs are perceived by at least some to potentially pre-determine policy design choices in international regime contexts, thus indicating at one of the policy-relevant contributions that GEAs can make to policy processes.

Such significant challenges raise the question of what kinds of PPAs in GEAs are feasible (if at all), and if the related costs can be outweighed by the benefits. While the feasibility of PPAs in GEAs is an open empirical question awaiting future testing in GEAs

(and systematic *ex post* analyses of these), effective response strategies for these challenges could enhance the feasibility and reduce the costs of PPA enterprises.

4.5 Response options

This section considers three strategic response options to address the challenges of PPAs in GEAs. First, the interviews and literature review suggest that an analytical framework for PPAs in GEAs that would be broadly shared and accepted and that could coordinate and guide such collective enterprises is lacking. Section 4.5.1 suggests some elements for such a framework. Section 4.5.2 draws on the OMC framework developed in Chapter 2 to argue that in order to ensure feasibility and quality, GEAs must carefully align the scope and objectives of their PPAs with the available resources (including expertise, available peer-reviewed literature, time, and funds). Finally, Section 4.5.3 examines the options for expanding the feasibility frontier of PPAs in GEAs by investing in research and communities of practice that can develop and deliver the required knowledge in the mid- to long-term.

4.5.1 Developing a shared analytical framework

The interviews with the authors of the GEO-5 and other GEAs, such as the IPCC, suggest that there is a lack of shared terminology, conceptual frameworks, and methodologies that would facilitate the resolution of the challenges discussed in the previous section. This subsection proposes three interrelated perspectives that aim to stimulate discussion on a conceptual PPA framework that could be adopted by future GEAs. Clearly, given the significant conceptual challenges, these perspectives do not resolve the task of developing such a framework, but attempt to provide relatively meta-level indications on which direction to take in further research and discussions on this subject.

The first perspective emphasizes the distinct opportunities that arise from creating "dynamic maps of knowledge" by developing assessments of *ex post* and *ex ante* policy analyses. This approach systematically explores alternative future policy pathways based on lessons learned from past policy experiments. The second perspective highlights the need to consider multiple objectives in environmental policy assessments held by multiple actor groups across multiple levels of governance, and how these objectives may be operationalized as target values of system indicators. The third perspective conceptualizes PPAs in GEAs as enterprises that aim to provide answers to a range of basic public policy questions by employing a large variety of scientific methods developed in very different scientific communities. The following proposal for a more formal definition of PPAs in GEAs highlights the themes that are considered in these perspectives:

Public policy assessment refers to the meta-analysis and synthesis of multiple *ex post* and *ex ante* policy analyses that provide society and policymakers with high-quality information for the discursive deliberation of policy instruments and institutions that may be implemented to achieve different sets of societal objectives (such as the provision of consumption goods, food, water, health services, education, etc.) under uncertain conditions.

The dimensions for specifying the domain of these assessments include the considered time period, the specific geographic location, jurisdictional level, multiple interaction systems, actor groups, policy objectives, and others. *Ex post* PPAs can provide basic empirical information on past system trajectories and thus inform basic problem understanding. They can also systematically monitor—based on empirical data—how policy instruments and institutions in specific contexts succeeded or failed at achieving formally and informally envisaged public policy objectives. They might also investigate how specific policies have changed systemic outcomes relative to counterfactual scenarios. Meta-analyses and syntheses of *ex post* policy analyses can reveal generalized lessons about the interrelation between policies multiple objectives pursued by diverse groups of agents, how they are affected by coupled and highly complex social-economic-technological-environmental systems that interact across multiple scales, and how they are affected by multiple interacting policies aimed at changing the probability of systemic outcomes towards better attainment of politically envisaged objectives. *Ex post* analyses provide the empirical basis to inform *ex ante* PPAs of how the adoption of alternative combinations (and trajectories) of policy instruments and institutions may lead to the attainment of different vectors of objectives in the future. *Ex ante* PPAs in GEAs involve analyzing business-as-usual pathways and a set of alternative policy pathways (or scenarios) that take into account the interdependencies between policies, complex coupled systems, and multiple objectives under conditions of uncertainty. The alternative policy pathways mapped in such exercises are characterized by different assumptions about future systemic developments and policy designs.

(a) Policy assessment as *ex ante* mapping of alternative future policy pathways informed by *ex post* assessment of empirical policy lessons

The conceptualization of policy assessment in GEAs as the mapping of alternative policy pathways appears as a promising approach particularly for dealing with the challenges of complexity, uncertainty, and divergent viewpoints. The concept is rooted in the Pragmatic-Enlightened Model of Scientific Policy Advice as developed by Edenhofer and Kowarsch (2014). It also builds on literature considering policy analysis as the exploration of policy alternatives (e.g. Pielke, 2007; Stirling, 2008), *ex ante* scenarios for policy assessment (e.g. van Vuuren et al, 2012), policy design (Howlett and del Rio, 2013), and *ex post* evaluation of environmental policy (e.g. Mitchell, 2008). The core idea is to design solution-oriented GEAs as PPA exercises that develop "dynamic knowledge maps" of alternative future policy pathways. By responding to specific public policy questions (see below), and by systematically distilling related lessons from past policy experiments, these maps can ideally catalyze collective learning processes in public policy discourses that are often characterized by disputing divergent viewpoints.

The right hand side of Figure 4.1 illustrates the idea of exploring alternative *ex ante* policy scenarios, including comparisons of these with a range of business-as-usual scenarios that reflect key uncertainties. A variety of methods may be employed to explore future policy pathways, including qualitative scenarios and quantitative integrated assessment modeling. *Ex ante* analysis of business-as-usual scenarios can fulfil several functions, such as structuring reflections about policy domains, or more specifically clarifying the question if existing policy schedules are expected to sufficient to meet future policy objectives (e.g. UNEP 2013). This can provide basic information of whether policy attention to an issue should be increased (if projections indicate that future objectives will be failed) or decreased (if objectives are expected to be met). Another potential function of *ex ante* assessment is to systematically compare alternative policy proposals e.g. put forward by different stakeholder groups, and analyzing the expected outcomes along each scenario pathway with regard to a consistent set of policy objectives (see next subsection). Such information ideally improves the quality of the knowledge base of the related public policy discourses and catalyzes discussion, thus potentially leading to improved quality of policy (see also Chapter 5).

Taking uncertainties of alternative pathways into account systematically (represented by the transparent dots lines in Figure 4.1) has emerged as a good practice in such exercises, as exemplified by the IPCC (Mastrandrea et al, 2011; see also the other article in the related issue of *Climatic Change* journal). The cross-sector scenario synthesis and analysis in the IPCC WGIII AR5 provides one example for an *ex ante* policy mapping approach based on a quantitative modeling analysis: More than 1000 alternative atmospheric GHG stabilization scenarios—ranging from stabilization levels consistent with the 2°C target by 2100 to business-as-usual projections—were analyzed with respect to the macro-economic costs of attaining them, the technologies required, the impacts of different global policy timings, the non-availability of technologies, and other dimensions (IPCC, 2014). Analyzing a range of scenarios from a range of models is one way to deal with the fundamental uncertainties of these projections.

Providing reliable *ex ante* maps of policy pathways requires adequate knowledge of the key relationships within and across political, social, economic, technological, and natural systems, and how policies interact with these systems. Such knowledge is generated in *ex post* analyses, as indicated on the left hand side of Figure 4.1. In particular, *ex post* PPA may comprise syntheses of quantitative and qualitative empirical data including numeric and more qualitative indicators. Indicators can provide insights on systemic variables, such as GHG emission levels, GDP, water availability, air pollution, etc. (UNEP 2012). They may also provide information on policy variables, such as carbon prices (Kossoy et al, 2014) or fossil subsidy volumes (OECD 2012), or other policy relevant indicators. Institutional data are often more qualitative and may include information on the evolution of laws, organizations, and broader governance regimes (e.g., Dubash et al., 2013; GLOBE International, 2013). Such data may be gathered by government agencies, academic studies (including case studies), businesses, or other stakeholders. GEAs must deal with the challenge of collecting and consolidating these data to enable synthesis. Uncertainties may also arise with regard to *ex post* data, e.g., from inconsistent data sources that employ different data collection methods and need to be managed. These uncertainties are represented by the transparent dots on the left hand side in **Figure 4.1**.

It is useful to distinguish these three approaches to *ex post* analyses in the context of GEAs (see Figure 4.1). First, reporting and analyzing historic developments of indicators and other empirical data informs

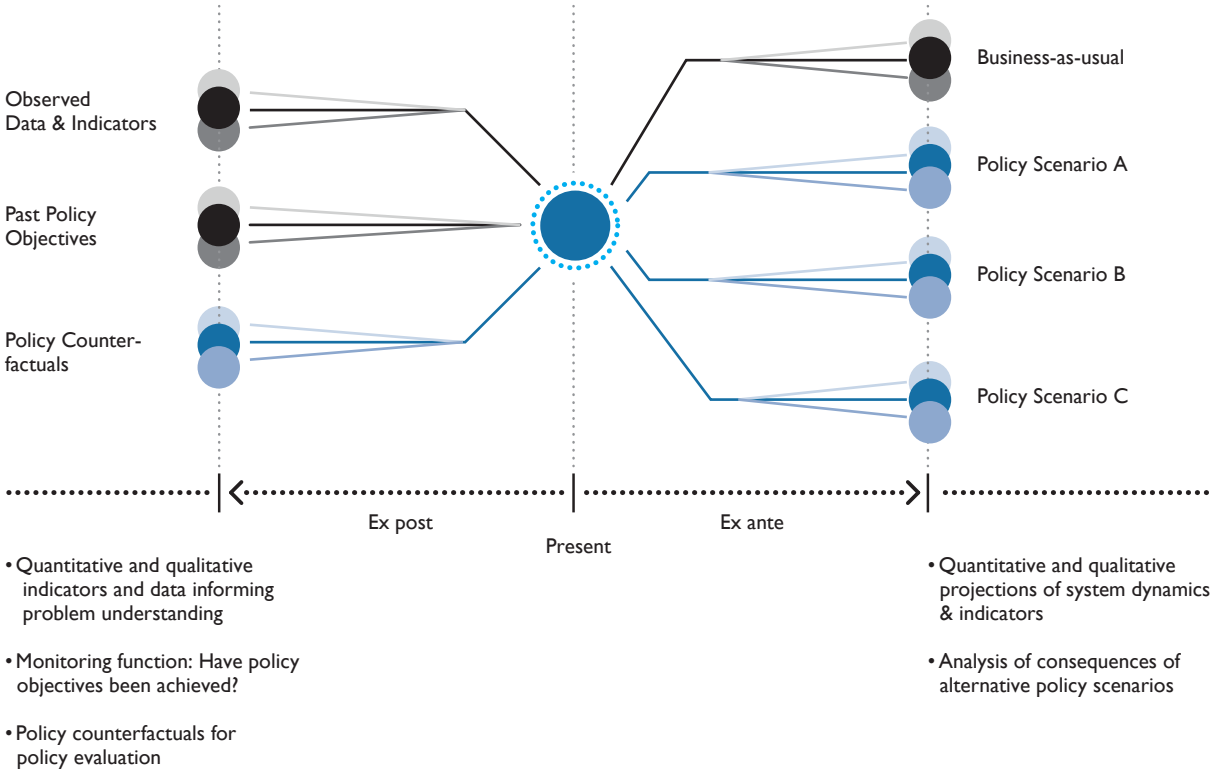

Figure 4.1. - *Mapping ex post and ex ante policy pathways in public policy assessments*

attempts at *problem understanding* regarding global environmental challenges, such as the interrelation between various drivers of environmental change with environmental states, pressures, and impacts. This is routinely done in GEAs and policy analyses more generally, especially regarding "hard" indicators, such as natural-system variables or GDP. This is done less routinely for "soft" variables, such as policy indicators and institutional data. The example of the IPCC AR5 WGIII SPM controversy on the presentation of "hard" historic GHG data (Edenhofer and Minx, 2014; Victor et al., 2014; Dubash et al., 2014) illustrates that even seemingly "merely" descriptive exercises can become subject to heavy politicization.

Second, systematically comparing the historic development of policy-relevant indicators with historically envisaged formal or informal policy objectives (i.e., the target values of these indicators) provides a *policy monitoring function*. Such exercises can increase the transparency and accountability of policymaking, reveal policy failures, and suggest the need for policy reform. The GEO-5 report pioneered this approach by reviewing the status of progress towards meeting 90 internationally agreed goals and identifying gaps in their achievement (UNEP, 2012; see also Jabbour et al, 2012). The Millennium Development Goals (MDGs) Report (UN, 2013) provides an analogous function for MDGs, and the emerging SDGs offer an opportunity to set up related monitoring functions in the future. Given potential controversy even over the "merely" descriptive function of indicator tracking discussed in the paragraph, systematic monitoring of goal attainment e.g. at national or regional levels involves risk of politicization. At the same time, it should be considered domestic policy monitoring functions (and even evaluations) are regularly performed by international organizations such as the IMF or the OECD.

Third, comparing empirical data with carefully constructed policy counterfactuals enables the evaluation of *ex post* policies, as well as learning about the performance of actual environmental policy experiments. Synthesizing the case studies of specific policy instruments or institutions (such as of the EU ETS), and comparing such syntheses across policy instruments (e.g., comparing the EU ETS with other emerging GHG trading systems, or other types of policy instruments with similar objectives, such as subsidies or standards) promises to enhance systematically the quality of policy information. Such analyses need to

[1] Including those incorporated in the OECD database on instruments used for environmental policy and natural resources management (OECD, 2014).

take into account the uncertainties and methodological challenges associated with any counterfactual analyses, as indicated by the transparent dots in Figure 4.1. Given the significant volume of the analytical requirements for this task (Section 4.4), GEAs need to carefully consider how much and what type of synthesis of existing *ex post* policy evaluations they can realize within their project cycles, as suggested by the interviewees' experiences with the policy analysis in GEO-5.

It needs to be taken into account that any top-down aggregation of such information within GEAs requires the generation of bottom-up case studies of policies that lend themselves to synthesis. Where such a knowledge base is not available, GEAs should carefully consider engaging in such exercises and select a clear and relatively narrow focus for analysis, as they will have insufficient resources to tackle this task in a broader sectoral, spatial, temporal, and policy domains (see Section 4.5.2). In view of the challenge of divergent viewpoints in solution-oriented assessments (Chapter 5), by emphasizing the importance of exploring multiple *alternative* pathways, this approach enables scientists to investigate policy options that are relevant within policy discourses, without having to choose between them or advocate for a specific position. In metaphoric terms, scientists can act as cartographers of the solution space, while policymakers and the public play the role of navigators, charting the course of societal policy (Edenhofer, 2012; 2014). While researchers might incorporate the policy alternatives they personally prefer into a set of explored (i.e., mapped) scenarios, researchers can and should just as rigorously examine different pathways proposed by others with alternative viewpoints. The task of scientists is then to provide reliable information that can be used for the discursive deliberation of alternative policies, while political decisions are ultimately made in legitimate political processes that are informed by policy discourses.

(b) Exploring policies in a multi-objective, -scale, and -agent space

Figure 4.2 offers a conceptual overview of some key analytic dimensions to be explored in *ex post* and *ex ante* policy assessments, thus providing more detail on the characteristics of policy pathways represented by the lines in Figure 4.1. Starting from the left hand side of Figure 4.2, there is a wide range of policy instruments and institutions available that may be adopted to influence complex coupled multi-scale natural, technological, economic, political, and social systems (indicated in the middle of Figure 4.2). These systems produce a range of outcomes that impact a vector of policy objectives, such as the provision of goods, food, health, energy, or inequality, but also environmental aspects, such as climate change (right hand side in Figure 4.2). Clearly, these objectives are interrelated in multiple ways. They could be impacted simultaneously by certain systems, or by directly interacting with each other (e.g., climate change will impact the provision of various goods). At the very right hand side of the figure, the actual outcomes and normative relative weighting of the (non-)attainment of policy objectives determines the welfare or well-being of various population groups. The prioritization (weighting) of policy objectives as arguments within an overall societal welfare function is often subject to divergent viewpoints and intense political conflicts. The complex political process behind naming the Sustainable Development Goals (SDGs) is illustrative of such inevitable struggles. Overall, Figure 4.2 illustrates that under conditions of uncertainty, public policies are essential to change the expected relative probability of the future attainment of societal objectives.

Figure 4.3 further complements this conceptualization of PPAs in GEAs by emphasizing the multi-scale nature of various interacting systems (left hand side Figure 4.3); indicating how the state and dynamics of these systems can be formulated in terms of indicators, which also provide the basis for setting policy objectives as goal values of these indicators (middle); which can then inform multi-level international environmental governance processes (right hand side), composed of multiple stakeholder groups that employ policies to govern the systems into which they are embedded (feedback arrow at the bottom of the figure).

PPAs need to carefully consider which indicators best to choose to inform complex governance arrangements operating across various jurisdictional levels and system scales. Choices need to balance feasibility (i.e. data availability) with the suitability of indicators for providing relevant information to policy discourses deliberating policy options that promise to effectively tackling problems and enhancing the likelihood of achieving policy objectives (e.g. Mitchell et al. 2008). Another key challenge for *ex ante* policy assessments in GEAs is to identify options on how different governance levels and stakeholder groups can adopt policy options that have a relatively high likelihood of synergistically complementing each other, thus leading to the attainment of policy options, rather than undermining one another (e.g., Howlett and del Rio, 2013). Such analyses need to take into account

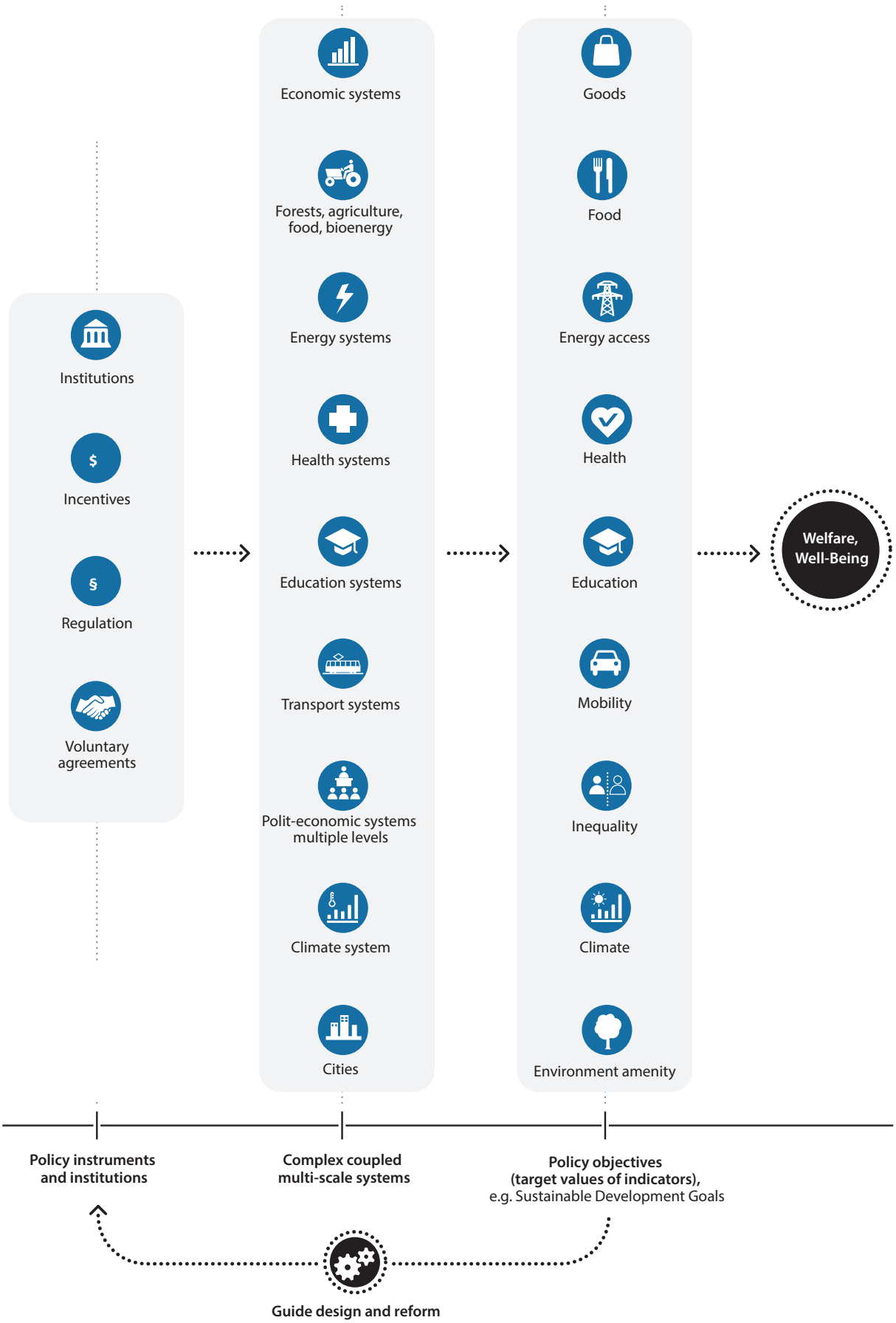

Figure 4.2. - *Conceptual illustration of the interactions between policy instruments, complex interdependent systems, policy objectives, and welfare. The figure is based on Edenhofer et al. (2014) and Jakob and Edenhofer (forthcoming).*

the respective objectives of and strategic interactions among these stakeholders, as e.g. analyzed in game theoretic approaches (and in other frameworks, in including ethical and behavioral approaches) (e.g. Edenhofer et al., forthcoming).

(c) Developing responses to key public policy questions by drawing on multiple approaches and methods

Deliberately cutting across the more analytic perspectives rooted in the "rational" tradition of policy analysis (Stone, 2012) that are embedded in the previous two subsections, the third complementary perspective stresses the need of a for including a discursive element in the conceptualization of PPAs in GEAs, linking this chapter closely to Chapter 3. The discursive perspective considers PPAs these as efforts to provide responses to public policy questions that policymakers and the public are deliberating. The answers to these questions are critical to constituting policy storylines that establish the legitimacy of political decisions to adopt and reform policy instruments (see Chapter 3). It is important to note that while these questions may often seem basic and simple, responding to them usually requires complex analyses that draw on multiple heterogeneous methodical approaches as well as the research communities that develop them.

Table 4.2 provides an overview of this conceptualization of PPAs by distinguishing a set of generically formulated policy questions that can be addressed in GEAs. The table does not claim to be comprehensive. Rather, it aligns each of the basic questions with illustrative examples and methods that have used to answer these questions in earlier GEAs. The selection and specification of the questions, approaches, and potential methods proposed in Table 4.2 also does not establish a guiding benchmark. Instead, it serves to stimulate explicit debate about these choices when designing specific GEAs and the research projects that inform them - a comprehensive and systematic catalogue of PPAs and their methods in GEAs does not exist (IPBES, 2011). Alternative questions may be formulated (Hackman et al., 2014), and other approaches and methods may be employed. Importantly, these generic questions would always need to be formulated case- and context-specific, and embody a range of sub-question, the deliberation of which forms the structure of public policy discourses.

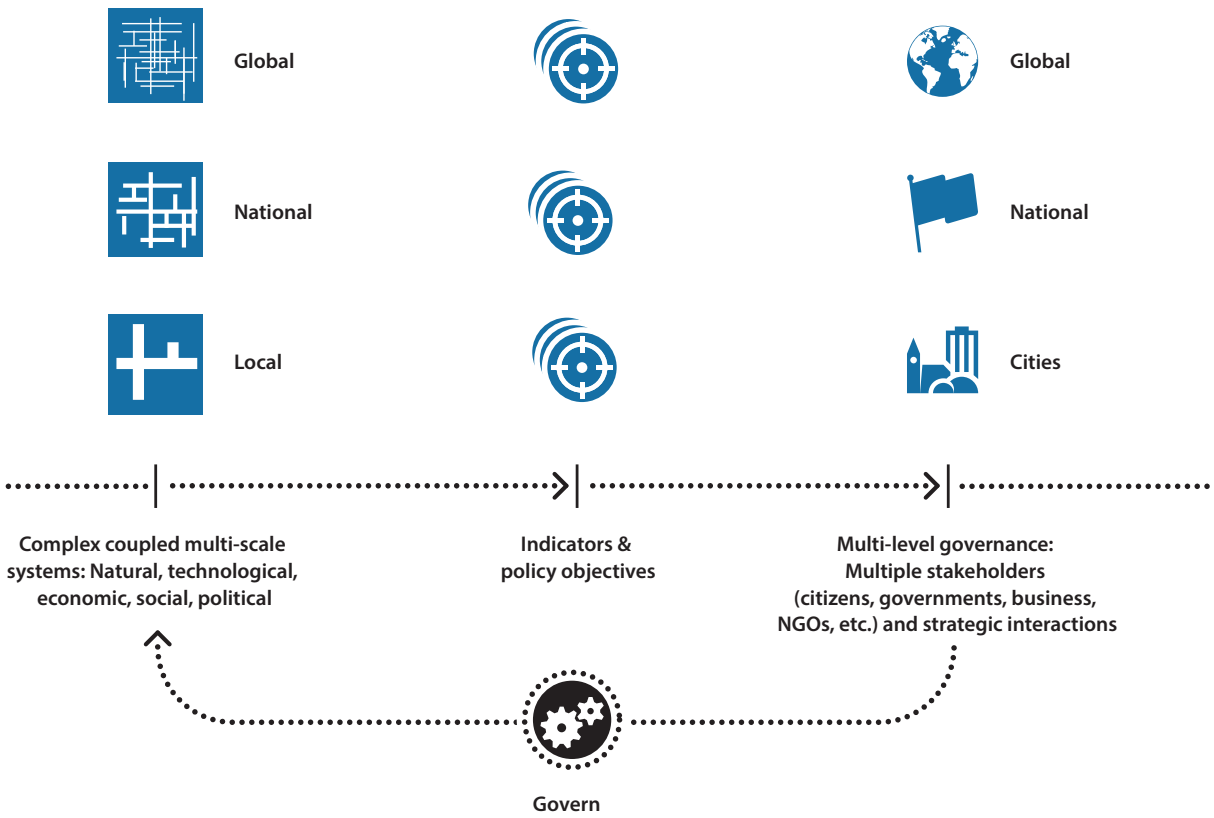

Figure 4.3. - *Conceptual illustration of the systemic multi-scale and multi-level governance domain of PPAs in GEAs, and the potential for indicators to provide interfaces between systems analysis and policy discourses.*

Table 4.1: *Illustrative examples of policy questions addressed by GEAs and the approaches and methodologies that might be employed in this context. The table does not claim to be comprehensive but, rather, aims to illustrate and structure the multiple options for PPAs in GEAs.*

Questions (examples)	Approaches (examples)	Methods (examples)
1) What are the priority environmental and related societal challenges?	Identifying challenges	Structuring indicators on natural system drivers, pressures, states, impacts (data analyses, modeling, etc.)
		Socio-economic impact studies (qualitative, quantitative: costs, cost-benefit, etc.)
	Priority ranking of challenges	Cost-benefit analysis, multi-criteria, and risk analysis, etc.
		Stakeholder elicitation (workshop, survey)
2) What are the appropriate environmental policy objectives?	Normative considerations informed by system and policy analysis	Qualitative analysis, quantitative integrated assessment modeling of costs, risks, and benefits; ethics, etc.
3) Are we on track to meeting the policy objectives?	Ex post indicator analysis	Indicator data monitoring and comparison to past policy objectives, etc.
	Ex ante indicator analysis	Quantitative scenario modeling, etc.
4) What is preventing us from attaining the policy objectives?	Analysis of system drivers	DPSIR, Kaya, IPAT, etc.
	Analysis of social system conflicts or problems	Game theory, political economy analysis, opinion surveys, ethics, etc.
5) Which policy instrument combinations and institutional set-ups have actually worked to achieve a set of objectives in the past? Why did they work? What did not work and why?	Report best practices	Systematic or non-systematic choice & description of policies considered to be best practices
Systematic ex post policy instrument assessment		Systematic evaluation of available case studies for single policy settings and across policy settings
6) Which alternative policies would achieve alternative sets of objectives in the future?	Policy design	Modeling of policy costs & benefits, economic theory, Institutional and legal analysis and design, etc.
	Policy database	Systematic compilation of specific policies and their features as informed by theoretical considerations and empirical ex post evaluations, to inform future policy choices
7) How are different groups expected to be affected by alternative policy choices?	Analysis of economic distributional impacts	Economic modeling of cost-benefit distribution, etc.
	Analysis of other impact dimensions	Multi-criteria analysis, risk analysi, etc.
8) How can winning policy coalitions in political decision-making be built?	Political economy analysis	Economic analysis of (re-) allocation of rents, identifying veto players, etc.
	Policy narratives	Storylines linking problems, solutions, and attributing responsibilities, etc.

4.5.2 Aligning the scope and objectives of PPAs with the available resources

The previous sections underlined the significant complexity of PPAs within GEAs. Combined with the challenges of sometimes lacking peer-reviewed literature and pervasive uncertainty (Section 4.4), and given the significant resource requirements for the conduct of comprehensive PPAs in GEAs, it is, therefore, important to carefully delineate their focus along the conceptual lines identified in the previous subsection: Which policy questions are to be addressed? Which approaches, methodologies, and expert communities need to be involved? Which policies, systems, objectives, regions, and stakeholder groups should be considered? Which types of *ex post* lessons shall be scrutinized, and which alternative future policy pathways are to be considered?

Drawing on the OMC framework developed in Chapter 2, it can be argued that the failure to strike a manageable balance between the objectives and resources of a GEA introduces the risk of either not attaining the envisaged objectives, or having to re-orientate the entire assessment process during its operation, i.e. eventually having to compromise on the envisaged objectives. At worst, the PPA exercise may lack credibility and hamper the reputation of the overall GEA GEO-5 provides evidence of the former challenge because it set out an ambitious agenda for more systematic policy assessment that eventually had to be re-oriented towards reporting best regional practices due to the significant challenges this exercise was facing in terms of, inter alia, restricted time, a lack of policy instrument case studies in the peer-reviewed literature available for the assessment, and the limited number of authors with PPA expertise in the writing team. The interviewees indicated that such adjustments can adversely affect process efficiency, and motivation. This suggests that under uncertainty over the optimal alignment of objectives and resources – which needs to be systematically taken into account in GEA design – a strategy for developing more benign and achievable objectives from the outset may be preferable. Increasing the level of ambition as the assessment process unfolds may enable a more satisfying product that achieves a broader and more ambitious set of GEA objectives than starting with an overambitious agenda that needs to be reduced over time. A counterargument is that starting with an ambitious agenda and cutting back later may help mobilize the maximum amount of resources from contributors. However, it seems that neither approach is ideal; a context-specific balance should be envisaged.

A fundamental choice in the design of policy assessments in GEAs seems to be whether the scope of the objectives and questions are narrow—with inquiries focusing on (relatively) deep analyses on the selected issues—or broad, resulting in a very costly and comprehensive, or at worst analytically shallow exercise, depending on the available resources (and the efficiency of utilizing them). A broad and deep approach would require expertise and integration of knowledge from many areas, which would draw on various research communities and render the process expensive in terms of time, funds, and process management. The main advantage of such a broad approach is the ability to tackle a wide range of interrelated questions that, together, constitute the entirety (or at least large areas) of a policy discourse domain, thus offering a comprehensive and integrated overview that can inform policymaking processes. The IPCC is an example of such an ambitious approach. In fact, one GEO-5 CLA voiced the concern that the IPCC was so resource-intensive that it absorbed much of the analytic resources available in the global environmental-change domain, leaving little resources for PPA on other environmental challenges. By contrast, if the policy assessment objectives and questions are quite narrow, fewer resources—money, time, number of authors—are needed to achieve a highly credible product. The UNEP (2013) Gap Report is an example of such a relatively focused policy assessment product (compared to GEO-5 and IPCC AR5 WGIII, which are comprehensive large-scale GEAs) that studies a specific policy question in depth (i.e., are we on track for meeting policy objectives?).

Ensuring an appropriate match between the objectives and resources in a GEA is a particularly relevant issue during the preparatory and formal-decision phases of an assessment. An important consideration during formal scoping sessions is the breadth of scope, in view of the available resources, including those offered by governments. It is also worthwhile to avoid an excessive accumulation of objectives, which may occur if no party objects to adding an objective because it has no reason to argue against it.[2] Instead, it could be valuable to invest resources into deliberating which objectives to exclude—and relegate these to other research initiatives, such as other GEA processes—in order to avoid overburdening the GEA. While this may not always be attractive due to the conflicts that such restrictions may entail, it might pay off in terms of higher quality and more focused assessments.

For example, promising truly comprehensive and systematic global policy databases (or policy banks) that feature reliable policy analyses across multiple dimensions and that can readily inform policy processes seems beyond what is feasible given the current state of research on environmental policies (as suggested by the experience of GEO-5). More narrow efforts that offer targeted assessments of specific policies as starting points to be included in policy databases, or an orientation of GEAs towards different objectives altogether, seem more appropriate. Carefully checking the availability of peer-reviewed (or other high-quality) literature in a policy domain is another way to enhance the likelihood of success. Another option, developed by IPBES, is preparing a pre-scoping document. The IPBES process is developing such a document (about 30 pages volume) to orient the scope and objectives of a global assessment on biodiversity and ecosystem services (IPBES 2014).

It might also be desirable to enhance understanding of what tools are available for specific purposes (as illustrated in Table 4.2), including a more detailed analysis of the respective advantages and drawbacks of these approaches and methods, to facilitate the strategic design of future GEAs (this was noted by several GEO-5 CLAs in the interviews). A comprehensive and systematic catalogue of policy assessment approaches and methods in GEAs is currently not available (IPBES 2011). Developing such a repository of available approaches and methods and advancing our understanding of how these can be used at the science-policy interface to achieve certain GEA objectives in specific situations might be valuable to increase the efficiency of future GEAs. Such an exercise might also help to reveal gaps in knowledge, thereby guiding future research efforts. Also, it might facilitate GEA management by indicating more clearly at the inception and throughout the production phase what kind of expertise is required to implement a policy-assessment task. However, the significant costs of developing such a repository over time need also be taken into account.

In addition to the time allocated for writing a report, and the funds made available for hiring organizational staff, conducting meetings, securing contributions to the GEA, recruiting the right expertise in terms of individuals and communities is central for the success of a GEA. In this context it is important to assess both the competencies and experiences of the individuals in terms of the knowledge that a GEA intends to assess. Systematic *ex post* policy assessments will require individuals who are experienced in this strand of research, such as researchers skilled in economics, politics, legal sciences, and other relevant disciplines; if IAM models are to be used, experts from the IAM community have to be recruited. While there are no easy indicators to measure an author's level of expertise, a general guideline could be that the participating authors be acknowledged globally as leading experts in their respective fields. If at all, GEAs usually control for this by including only academic scholars in their writing teams, and may conduct checks of their peer-reviewed publication metrics. Still, as stated by many interviewees, even top-level academics may not be the best suited to conduct policy assessments in GEAs because carrying out a specific study is very different from assessing an entire body of literature in a manner that may be used to inform public policymaking. *Inter alia*, the latter task requires an openness to adopting and communicating multiple and divergent perspectives, as well as a strong motivation to create a product that exhibits strong public good characteristics. The individual (time) costs of intensely engaging and displaying leadership are not necessarily matched by the individual returns. For example, authors' names are displayed on GEA chapters regardless of how much they contributed. These issues regarding leadership and the willingness to engage were named by numerous interviewees as important challenges in GEAs, and are among the factors that might be taken into account in future author selection processes (see also Haas and Mitchell, 2013).[3]

Finally, Section 4.3 identified three key potential benefits from PPA in GEAs: Supporting international policy regimes, facilitating the global diffusion of policy lessons, and supporting environmental policy agenda-setting processes at multiple levels. One key consideration guiding the specification of the PPA-relevant scope and objectives of GEAs should be which of the three main benefits should be realized, as addressing all of them simultaneously might again risk overstretching the ambition of a GEA. Also, a GEA that focuses on the global or international policy assessment dimension will require a different design and resources than a GEA that aims to facilitate the diffusion of lessons-learned in domestic policy experiments. As discussed in Chapters 2 and 3, such strategic decisions must be guided by considerations regarding the contextual policy discourses and

[3] To tackle this incentive-structure problem, Tol (2014) suggests a review procedure similar to a peer-reviewed scientific journal for chapters in the IPCC. This would imply that co-chairs and other GEA editors can reject chapters if they lack quality.

processes, and the types of contributions that specific GEAs can make to these.

4.5.3 Expanding the feasibility frontier: fostering the development and supply of data and policy research underpinning PPAs in future GEAs

One of the main resources that GEAs require in order to generate high-quality public policy assessments is research in the form of data and policy analyses and assessments that are produced outside of formal GEA processes. A key strategic option for enhancing future GEAs is to systematically work on improving the knowledge base upon which they build. For example, addressing the question, "are we on track to meeting policy objectives?" on a global scale requires collecting and synthesizing reliable data on relevant empirical indicators, which is a significant challenge, as reported by GEO-5, and several interviewees. Adequate incentive structures are required to obtain data from various sources that are already available (including governments and business), as well as to initiate the collection of this data in the future.

Addressing other questions in GEAs, such as "which policy instrument combinations and institutional set-ups have actually worked to achieve alternative sets of objectives in the past?" or "Which alternative policies would achieve alternative sets of objectives in the future?" requires a set of high-quality case studies of specific policy instruments and their combinations and interactions with case-specific institutional settings that lend themselves to aggregation and synthesis in a GEA. Alternatively, *ex post* policy instrument assessments that compare and aggregate experiences and lessons-learned from different contexts and applications worldwide may be conducted outside of GEAs (e.g. Auld et al, 2014). GEAs would thus be enabled to review these results, and could avoid conducting the complex and time-consuming analysis themselves. In this context, Beck et al. (2014) distinguish first-order (standard) and second-order (GEA) knowledge production. One model of an exercise that integrated the production of first- and second-order knowledge is the coordination of the IAM research community prior and parallel to IPCC AR5. This community set up a formal coordination forum[4] to globally coordinate and initiate a number of research projects that generated the peer-reviewed research results that fed not only into the IPCC AR5 report, but also into the UNEP Emission Gap report. More generally, global and sub-global research projects that analyze environmental policies in order to aggregate these insights into GEAs and, thereby, inform global policy discussions could be initiated by research communities themselves, by GEA processes, or both. Such projects would ideally anticipate the specific challenges of GEAs, i.e., the need to accommodate multiple perspectives and stakeholder groups with multiple and sometimes conflicting objectives, as well as the specific opportunity to inform global policy discourses and policy fora. This would suggest a focus on international policy instruments and the potential to coordinate domestic policies via international fora within GEAs. However, from a policy diffusion perspective, sharing the syntheses of comparative sub-global policy studies could also benefit the quality of policymaking in all world regions.

One example of such linkages of first- and second-order knowledge is the research conducted by Elinor Ostrom and her collaborators: They coordinated individual researchers and research groups to engage in local common-pool-resource (CPR) management case studies, and to aggregate and analyze these case studies (e.g., Ostrom, 1990); furthermore, they complemented these analyses with theoretical work (e.g., Ostrom, 2005), in order to derive generalized lessons from the factors affecting the governance of CPRs. In the area of global environmental-policy-instrument analysis (except in the related IAM community), few examples of such intense coordination seem to exist. Initiating the related projects and community efforts might be difficult, and incentives need to be restructured to create benefits for researchers to address the questions that GEAs are supposed to answer. Public and private research-funding agencies at the domestic and international levels can play an important role in providing these incentives.

GEAs can also play several roles in catalyzing such processes. First, workshops that are explicitly devoted to the questions of appropriate PPA frameworks, or on how to ensure a sufficient supply of research at the beginning of GEAs might be helpful to stimulate community coordination. Some of the fruits of such coordination may only materialize after the formal completion of GEA s due to the longer time horizons involved in thorough academic research. In fact, with iterative GEAs being produced at relatively high frequencies, the assessment might synthesize the

[4] The Integrated Assessment Modeling Consortium IAMC, see http://www.globalchange.umd.edu/iamc/ Such a "threat" of reputational loss might help re-structure incentives within GEA writing teams.

research developed during the previous iteration, while researchers can produce parallel novel research that can feed into the next iteration of the GEA. GEAs can contribute to such capacity building by identifying gaps in knowledge, leveraging existing partnerships, networks and centres of excellence to engage a broader range of experts. GEAs might also be equipped with funds to explicitly contract new research. However, research communities might also self-organize towards systematically developing research programs and funding strategies to inform future GEAs, including the social sciences and humanities (Weaver et al, 2012). Finally, leading GEA researchers and organizers might formally or informally communicate with public and private research-funding agencies, as well as academic organizations, so that they can adjust their funding programs and incentive structures to incentivize research that targets the gaps in knowledge that are revealed by GEAs.

4.6 Conclusions and recommendations

Summing up, policy assessment in solution-oriented GEAs offers the opportunity of enhancing the quality of public policy discourses and resultant policies. These enterprises in GEAs bear the three distinct opportunities of informing and potentially facilitating deliberations over and the implementation of global and international policy regimes; facilitating the diffusion of domestic policy lessons and related collective learning processes across regions, and sometimes disputing stakeholder groups; and supporting environmental policy agenda-setting processes by initiating more explicit, systematic and rational public discourses.

To realize these benefits, public policy assessments within GEAs need to adopt strategies for responding to several fundamental challenges, which include the complexity of the domain of international environmental governance (IEG); prevailing research gaps in research on policy options; the pervasive uncertainty of policy-related knowledge; and the disputed normative implications of such research. In addition to these challenges, the absence of a broadly accepted explicit meta-conceptualization of policy assessment in GEAs has hampered their design and conduct in the past.

The chapter has discussed three response strategies to these challenges: First, a broadly shared conceptualization of policy assessment in GEAs would facilitate their coordination in the future. To foster related discussions the chapter proposes a meta-level conceptualization of policy assessment in GEAs emphasizing (a) the opportunities of an approach exploring and mapping alternative future policy pathways, that are informed by systematically derived *ex post* policy lessons; (b) the multiple objectives, scales and actor groups that need to be considered; and (c) the variety of public policy questions that GEAs might respond to, drawing on diverse available approaches and methodological expertise.

Second, GEAs need to carefully match their scope and objectives of analysis to the limited resources (including expertise, time, funds) that are made available to them. For a given set of resources they need to manage a tradeoff between the benefits of being comprehensive and shallow, versus being focused but deep. Concerning the setup of GEAs, a high premium should be put on careful management in matching the formal scope and objectives of GEAs with the available resources (time, money, and expertise). This involves selecting the policy questions GEAs address in view of the availability of approaches and methods to credibly address them, and the research communities that the GEA will be able to engage in the writing process. This particularly includes reaching out to research communities engaged in the systematic analysis and assessment of global and sub-global policy instruments and institutions drawing on disciplines such as economics, political science, or legal analysis, and that are open to adopt complementary approaches and collaborations in developing answers to the questions that GEAs pose. Formal GEA mandates should avoid "overaccumulating" lists of tasks that cannot be realistically and at satisfactory levels met given the limited resources that are available.

Third, investments into the development of various research communities addressing policy questions raised by GEAs would advance the "feasibility frontier" (capacity) of future GEAs in delivering policy assessment. This will often involve enhancing the organization and contribution of the social sciences and humanities. GEAs can contribute to such capacity building by identifying gaps in knowledge, leveraging existing partnerships, networks and centres of excellence to engage a broader range of experts. Other institutions such as research funding agencies or academic institutions have an important role to play in enhancing the individual incentives for researchers to orient their work towards producing knowledge that addresses the policy-relevant needs and questions addressed by GEAs. Similarly, research communities themselves have a role to coordinate themselves towards providing analyses and methods that tackle these questions,

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Chapter 5

The treatment of divergent viewpoints

ABSTRACT

The adequate and legitimate treatment of divergent viewpoints regarding policy options and their underlying environmental problems poses a natural challenge for all Global Environmental Assessment (GEA) processes, and particularly to those contemporary solution-oriented GEAs. This chapter analyzes the general approaches (i.e., ideal-type strategies) of selected GEAs for responding to divergent viewpoints and their major conditions of success. Building on hypotheses derived from the science-policy literature and our own empirical research, nine different approaches are identified and empirical cases are discussed. Each approach has particular strengths and shortcomings, and their empirical analysis is challenged by the difficulty of acquiring robust, evidence-based data on the practical implications of these approaches. Yet, the appropriateness of each of these approaches seems to depend mainly on the more specific type of divergent viewpoints in terms of how complex, value laden and disputed the issues at stake are. Many instances of divergent viewpoints are routinely and successfully resolved in GEA processes. However, for particularly complex, value-laden, and disputed cases (e.g., the direct evaluation of environmental policy options), the GEA approach of exploring the implications of alternative policy pathways seems promising; although, practical challenges remain. To our knowledge, this research provides the first systematic and relatively comprehensive overview of actual approaches to divergent viewpoints in contemporary GEAs, which may promote more systematic reflections on how to design GEA processes in order to allow for more rational, open public discussions about such divergent viewpoints.

Key Messages

1. The adequate and legitimate treatment of divergent viewpoints on policy options or underlying problems is an inherent challenge for all GEAs, and particularly for solution-oriented. There is a very thin line between scientific and ethical-political divergent viewpoints.

2. Nine different formalized and informal strategies for responding to divergent viewpoints were identified in the GEAs analyzed; each of these posses various strengths and weaknesses. The appropriateness of strategy seems to depend mainly on how complex, value laden, and disputed the issues at stake are.

3. Many divergent viewpoints are routinely and successfully resolved in GEA processes. However, for particularly complex, value-laden, and disputed cases, the GEA approach of exploring the practical implications of alternative policy pathways seems promising; although, practical challenges remain. A clear mandate is required to coordinate the expectations of all the participating stakeholders.

4. When divergent viewpoints are present, GEAs can benefit from: sufficient resources (i.e., time, funds, and expertise); training to increase authors' leadership; intensive dialogue between scientists, policymakers, and the public; more transparency of divergent viewpoints and the way they are treated in GEAs; discussing and analyzing divergent viewpoints prior to the GEA process to reduce the analytic burden of GEAs, almost independently from which approach is chosen.

5. The different approaches for responding to divergent viewpoints ought to be discussed openly. The research presented here may encourage solution-oriented GEAs—despite the related risks and challenges—to address very complex, disputed, value-laden, and highly politicized divergent viewpoints more explicitly because promising coping strategies exist. Then, GEAs would be better able to acknowledge that we live in a world with multiple objectives, interdependencies, and trade-offs.

5.1 Introduction

Divergent viewpoints are among the major reasons why GEAs are initiated in the first place; in fact, they might even be regarded as their *raison d'être*. If scientific consensus and certainty, or full political agreement, on environmental problem formulation and policy options existed, GEAs would hardly be needed. In this sense, divergent viewpoints are a natural and essential characteristic of GEAs, which inherently deal with the uncertainty of complex natural and social system dynamics, as well as political disagreement. This is valid for both problem-oriented and solution-oriented assessments (see Chapter 2). The treatment of divergent viewpoints of all kinds is both the fundamental preoccupation of GEAs and the subject of their output. In several cases, GEAs have resolved or addressed divergent viewpoints quite successfully, particularly less "politicized" ones. The review and synthesis of the scientific literature that GEAs comprise, as well as the large-scale consultation and deliberation processes between different experts and stakeholders that GEAs facilitate have helped to resolve complex disagreements and initiate new research to overcome knowledge gaps and uncertainty.[1]

Despite successes, however, the adequate representation and treatment of divergent viewpoints remains one of the most fundamental challenges to GEAs (e.g., Cash et al., 2003). Generally, as many publications in science and technology studies (STS) show, opposition to assessment results and processes can occur if the stakeholders do not agree with the policy recommendations, assumptions, scope, or priorities of the GEA. Ultimately, as examples from the past show, scientific recommendations for policy-making can, in fact, be counterproductive and, as such, can exacerbate political controversies rather than resolve them in situations where there is no adequate and legitimate treatment of divergent viewpoints (Jasanoff, 1990; Sarewitz, 2004; Cash et al., 2003; Pielke, 2007). Discussions and concerns over the adequate treatment of divergent viewpoints in GEAs are, therefore, almost as old as GEAs themselves and still remain today, sometimes bringing into question the legitimacy[2] of certain GEA processes (Siebenhüner, 2003). For instance, the literature has paid particular attention to the IPCC (see the references listed in the introduction to this report; see also Sluijs et al. 2010; Hulme 2009 and 2010; Beck 2011; Tavoni and Tol 2010; IAC 2010; Stehr and Grundmann 2011; Edenhofer and Kowarsch 2014; etc.) because climate policy is a particularly heated issue in society today. The IAASTD process has also been subject to much discussion with respect to the adequate treatment of heated divergent viewpoints, in this case regarding agricultural issues (e.g., Feldman and Biggs, 2010).

The recent shifts and changes of GEA processes and contexts (see Chapter 2) intensify further the challenge of divergent viewpoints. They have also changed slightly the nature of these challenges. The multitude and complexity of GEA topics and the increasing diversity and number of stakeholders engaged in GEAs has resulted in a proliferation of divergent viewpoints. In particular, and more directly than problem-oriented assessments, solution-oriented GEAs are facing a very broad range of divergent political stakes, interests, and ethical values all over the globe when they analyze and evaluate concrete policy options. Moreover, there are manifold interrelations and interdependences with other policy fields and multiple governance levels, which means that even more viewpoints come into play (Victor, 2014; see Chapter 4). This does not necessarily mean that solution-oriented GEAs are by definition more controversial. But rather, as solution-oriented GEAs discuss potential (*ex-ante* analyses), or actual and past (*ex-post* analyses) public policy pathways relatively directly, the particular interests, values, and standpoints of policymakers and other stakeholders from different cultures and on different governance levels become more numerous and obvious, which are virtually impossible to evade if GEAs want to assess the potential policy solutions. When GEAs also include traditional knowledge,[3] the multitude of divergent viewpoints increases even further. In some of our GEA expert interviews, it was argued that GEAs should exclude socio-economic public policy analyses and assessments because it was assumed that the divergent viewpoints were so normative, "politicized," and value laden that scientific assessment could hardly resolve them. Yet, avoiding disputed policy-related issues in GEAs—or policy assessments altogether—would come at a tremendous cost to the science-policy interface (relationship) in terms of the lack of policy relevance. The literature on GEAs identifies potential trade-offs between the policy relevance, legitimacy, and credibility of GEAs (e.g., Cash et al., 2003): The more directly GEAs discuss relevant policy options, the higher the danger of bias and one-sided

[1] See Section 5.3 for examples.
[2] See Chapter 6 for an explanation of "legitimacy."
[3] See the plans for IPBES: http://www.ipbes.net/stakeholders/stakeholder-processes.html.

policy statements, while avoiding or watering down heated issues in GEAs, significantly reduces their policy relevance and salience (Siebenhüner, 2003).

Thus, while GEAs have successfully dealt with divergent viewpoints that were not highly politicized or directly related to the appraisal of policy options, GEAs, as they become more solution-oriented, increasingly face the challenge of adequately responding to divergent viewpoints that are more directly linked to disagreements about the appropriateness of environmental policy objectives and policy means (i.e., policy instruments and measures). This is what solution-oriented assessments are basically about (see Chapter 4). These types of divergent viewpoints may require employing or evolving a range of alternative and possibly new response strategies. Although there is no evidence that the solution-oriented GEAs in recent years have lacked legitimacy, the adequacy and conditions of success (or failure) of different GEA responses to such "directly policy-related" divergent viewpoints seem poorly understood thus far, making GEAs vulnerable to legitimacy debates at the very least.

The existing literature only partially and insufficiently supports GEAs in this challenge. On the one hand, there are many individual case studies of particular science-policy interfaces and their actual treatments of divergent viewpoints—a major area of research in STS and the related research fields (e.g., Jasanoff, 1990, Sarewitz, 2004, Pielke, 2007; Hulme, 2009). Moreover, the literature offers several theoretical reflections on and abstract models of divergent viewpoints in policy-making and at the science-policy interface (e.g., the literature discussed in Section 5.2). On the other hand, there is a scarcity of literature that analyzes, compares, and evaluates the treatment of divergent viewpoints in different GEAs[4] (especially contemporary solution-oriented GEAs) in a systematic and theoretically informed manner. This, however, would be very useful to enable future GEAs to learn from past experiences, given that the multitude and complexity of divergent viewpoints is often arguably much higher in large-scale intergovernmental assessments than in other science-policy settings upon which much of the literature is focused.

This chapter aims to address this research gap. It strives primarily to provide insights on the variety and characteristics of GEA approaches for responding to the old and new challenges of the divergent viewpoints discussed above. The envisaged better understanding of and reflection on the current GEA approaches through this analytical lens is intended to serve as the starting point and basis for further systematic scientific inquiries (beyond this chapter) into the many variants and performances of these GEA approaches. Yet, an empirical analysis and evaluation is challenged by the difficulty of acquiring empirical data on the implications of these approaches.

The research presented in this chapter may initiate and conceptually support systematic discussions about the appropriate design and conduct of future GEAs with respect to their treatments of divergent viewpoints. It is hoped that this will allow for a more open, rational, and constructive public discussion about such viewpoints. With this research and its conceptual and methodical framework, we intend to open up and structure the field for a more rational inquiry that is often only subject to informal dinner conversations or individual case studies. Furthermore, the need for "ad hoc" approaches to respond to divergent viewpoints in GEAs could be reduced, and if there were more explicit deliberation, the conditions under which a particular approach is appropriate (or not) would be better understood.

More precisely, this chapter analyzes the existing and potential approaches of selected GEAs for responding to policy-related divergent viewpoints (i.e., those viewpoints that are more directly linked to policy options) and identifies the key conditions for success or failure in order to inform the application of these approaches. It will be argued that the degree to which these divergent viewpoints are complex, disputed, and value laden is key for the appropriateness of a particular approach. This chapter does not primarily focus on the concrete practices of GEAs in terms of specific GEA processes, institutional settings, actor constellations, or concrete actions regarding particular cases of divergent viewpoints. Rather, this chapter focuses on GEA approaches in terms of *general* strategies to respond to policy-related divergent viewpoints; although, an analysis of the concrete practices and their implications is unavoidable for the application and full-fledged evaluation of these general strategies. Thus, this chapter offers a more fundamental and strategic analysis of responses to policy-related divergent viewpoints in GEAs. With it, this research systematically bridges and combines (i)

4 Exceptions regarding earlier GEAs include studies by the GEA Harvard project (see the introduction to this book).

a macro-perspective as given in (a) general models of political processes and democracy where divergent viewpoints are usually essential, and (b) general models for the role of the sciences in policy on the one hand, and (ii) the micro-level of concrete processes and institutions in GEAs on the other hand. The reason we focus on general strategies (referred to hereafter also as "approaches"), rather than, for instance, concrete institutions, is that improving concrete practices is hardly possible without an appropriate understanding of the general strategies that guide these concrete practices. Consequently, the intermediate level of analysis in this chapter is possibly the most urgent one to be addressed if one wants contemporary GEAs to have a better orientation toward policy-related divergent viewpoints.

5.2 Analytical framework and methods

For the purposes of this analysis, the term "divergent viewpoints" in GEAs refers to viewpoints that are *de facto* held by any of the various stakeholders of a GEA process (i.e., authors, experts, coordinators, institutions, policymakers, decision makers, target audiences, etc.; see Chapter 6), and which are perceived as disputable by others and are identical or relatively closely linked to the controversial standpoints upon which policy objectives and policy means prefer (in other words, directly policy-related divergent viewpoints). As an example, consider the viewpoints on a highly disputed topic, such as the potential risks of genetically modified organisms (GMOs) in agriculture. Under which conditions and in which parts of the world should a specific type of GMO be promoted or banned by policy? What does adequate risk management look like when GMOs are employed? And so forth. In contrast, scientific disputes about physical theories may have some policy implications, but only very indirectly. As a result, they are less policy-related. Yet, divergent viewpoints about the definition of political problems can sometimes be directly linked to policy objectives and, ultimately, policy options. Such policy-related divergent viewpoints in GEAs are often categorized as follows:

(1) The first category is *political and normative ethical* viewpoints, i.e., conflicting individual or group interests (e.g., an industry group requesting the promotion of a specific environment-related technology in a GEA), institutional interests (e.g., UNEP's institutional interests in the GEO process, see Chapter 3), and political goals and priorities, evaluation criteria, ethical values, social norms, normative ideas for political processes, etc., that determine the design and evaluation of policy options.

(2) The second category is *scientific* disagreements, i.e., divergent scientific standpoints on different levels, such as scientific theories and paradigms, methodologies, methods and approaches (i.e., different academic disciplines),[5] assumptions, data and estimates, interpretations, etc. Obviously, almost all scientific assumptions in GEAs can have an impact on its policy messages.

(3) However, these distinctions are not very useful categories because they can rarely be disentangled in empirical examples. These distinctions are *aspects* of almost all divergent viewpoints rather than different types or categories. For instance, disagreements that are typically regarded as "scientific" and "descriptive" can have strong political or ethical implications and motivations (e.g., discussions on anthropogenic climate change) at least in the interpretation of some stakeholders and observers (e.g., Sarewitz, 2004; Pielke, 2007). More fundamentally, much of the literature on the role of norms and values in scientific research in recent years suggests that facts and different kinds of values are often strongly entangled in scientific research, bringing into question the assumed strict separability of the descriptive and normative in the sciences (e.g., Putnam, 2004; Douglas 2009; Hulme, 2009; Ackerman et al. 2009; Beckerman, 2011; Dietz, 2013; Biewald et al. 2014). Moreover, institutional interests, such as UNEP's interest in positioning itself as the leading body on international environmental policy in line with its formal mandate, as well as certain environmental policy objectives held by certain interest groups, can be strongly dependent on disputed *scientific* insights, such as those regarding the degradation of the environment and its implications for human well-being.

Divergent viewpoints in policy discourses are often embedded in broader policy narratives (e.g., Shanahan et al., 2011; Urhammer and Røpke, 2013; IISD, 2013) that provide a more far-reaching, though rough, explanation of the issues at stake with both normative

[5] Such meta-level issues can at least indirectly influence or pre-determine the (type of) key messages and policy recommendations of an assessment (Hulme, 2009).

and descriptive dimensions. Again, this suggests that in GEA practice, divergent viewpoints frequently have both a descriptive and a normative component if analyzed thoroughly. Due to this entanglement, our focus is on "policy-related divergent viewpoints," instead of focusing on the misleading standard separation between issues of "ethical values and politics" and "scientific uncertainty." Hence, due to the often-observed entanglement of factual statements and values in scientific research, the solution to divergent viewpoints in GEAs is not to simply allocate the descriptive components to scientific research and the normative components to policymakers. Rather, responding to divergent viewpoints in GEAs usually means dealing with the dimensions of "truth" and "power" simultaneously (Jasanoff, 1990).

Divergent viewpoints can arise in all phases of the GEA process, including determining the mandate (e.g., discussing the thematic priorities and adequate scope, as well as disputing the storylines and policy narratives), producing and reviewing the chapters, and negotiating the Summary for Policymaker (SPM) with scientists and policymakers. In general, divergent viewpoints are not problematic *per se*, but are an inherent attribute of knowledge production, let alone basic communication, that needs to be acknowledged in any deliberation on public policies, including GEAs. From both a scientific (Popper, 1959; Kuhn, 1960) and a political perspective (democracy, pluralism), divergent viewpoints can be regarded as healthy. However, in decision-making processes, there is sometimes a pragmatic need to provisionally close down the debate by making a decision (although debates can continue after the decision is made).

This chapter looks at the following four GEAs: the Global Environment Outlook series (GEO), the assessments by the Intergovernmental Panel on Climate Change (IPCC), the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), and the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). The GEO assessment (and particularly GEO-5) was included because it is UNEP's recurring flagship assessment and is very comprehensive in terms of its coverage of regions and environmental challenges. The IPCC (with a particular focus on the Working Group (WG) III contribution to the Fifth Assessment Report [AR5]) because it is, on the one hand, often considered to be a role model for other GEAs and, on the other hand, is arguably the most publicly contested GEA that exists. The IAASTD was chosen because the treatment of divergent and highly policy-related viewpoints was one of the major challenges of this GEA (Feldman and Biggs, 2010). Finally, the IPBES was an interesting empirical case because its design efforts emphasize stakeholder engagement and the treatment of divergent viewpoints. At present, the available material on and experiences with the IPBES mainly consist of the guideline documents already available. Main methodical access to these GEAs was provided by the GEA documents and documentation, by our expert interviews (see Annex) with GEA participants, and the literature.

The approaches (i.e., strategies) for responding to policy-related divergent viewpoints in these GEAs were identified using an iterative-hermeneutic method of process tracing, which consisted of three steps. First, we derived the hypothesis that at least five different GEA approaches existed by examining a few seminal publications about the science-policy interface. We drew on the seminal body of literature on general science-policy models and those employed in GEAs (see in particular Habermas, 1971; Jasanoff, 1990; Siebenhüner, 2003; Millstone, 2005; Pielke, 2007; Edenhofer and Kowarsch, 2014). Such science-policy models have direct implications for how GEAs can, should, or must not respond to divergent viewpoints (on the nature of such models, see Edenhofer and Kowarsch, 2014). As such, these publications on science-policy models provided the starting point for our analysis in terms of a first approximation to identify and capture conceptually the diversity of existing approaches for dealing with divergent viewpoints in GEAs. More precisely, in our interpretation, almost all of the models discussed in the literature can be understood as variations of the science-policy models presented by Habermas (1971), i.e., the technocratic, decisionist, and pragmatic models.[6]

The five GEA strategies for responding to policy-related divergent viewpoints that we derived from the literature are in our terminology (Section 5.3 will explain these strategies):

- "Knowledge": mainly derived from the technocratic model
- "Political decision": derived from the decisionist model

[6] Pielke (2007), as well as Edenhofer and Kowarsch (2014), add variations of these models (in descriptive terms) that are widely regarded as undesirable "misuse" of scientific authority in policy.

- "Public discussion": mainly derived from the pragmatic (and democratic) model and its many variations in the literature
- "Map implications": derived from the specific pragmatic model introduced by Edenhofer and Kowarsch (2014)
- "Avoid": mainly derived from the pure scientist model by Pielke (2007) and the decisionist model.

The second step was to test these hypotheses empirically through GEA expert interviews (see Annexes) and expert workshops, and by examining the results of the GEA document analysis and literature review on GEA practices. This exercise empirically confirmed the existence of all five hypotheses derived from the literature analysis. The identification of such approaches in practice always requires some interpretation. In most cases, operationally relating the empirical material to these approaches is possible by (1) using relatively obvious indicators, including who was involved in the GEA treatment of divergent viewpoints, and (2) identifying the keywords used by the interviewees or documents that indicate the approach they chose to use in the respective GEA context.[7]

The third step was to identify any additional GEA approaches by analyzing and interpreting those parts of the empirical material that did not fit with one of the five pre-determined hypotheses mentioned above. Thus, these additional approaches go beyond the approaches derived from the limited body of literature in the first step. This empirical analysis of practices in GEAs suggests a more diversified picture than was captured by the just mentioned literature on general science-policy interface models and suggests the need to expand this initial typology. This led to the identification of the following four additional approaches:

- "Clarify meaning"
- "Expert judgment"
- "Negotiated compromise"
- "Revealed controversy"

In an iterative-hermeneutic manner, these additional approaches were then compared with and linked to additional literature describing similar strategies (though mostly in other contexts than GEAs).[8]

In practice, there are often combinations and overlaps between these approaches, and several of them may be employed simultaneously. Moreover, they rarely if ever occur in the explicit and consistent manner suggested by the distinction of the nine analytic categories set out here. In this sense, the approaches presented in this chapter are to be understood as "ideal types" (in the sense defined by Max Weber) that can be valuable analytical tools.

The next question is whether the nine identified approaches that are *actually employed* in GEAs already cover the most important theoretical *options* for future GEAs in terms of responding to divergent viewpoints. Though the STS literature discusses many further approaches and concrete practices regarding divergent viewpoints,[9] the nine approaches cover the predominant and most interesting empirical and theoretical approaches. Moreover, most of the additional ideas and practices discussed in the literature could be regarded as variations of those described here. Therefore, the nine approaches introduced above can be regarded both as a list of predominant actual strategies in GEAs and as a list of major options for future GEAs. However, as the descriptions of the nine approaches show, some constitute long-term projects that take place outside of the GEA process (e.g., the public discussion approach, see Section 5.3).

Finally, the analysis of the positive and negative aspects of the GEA approaches presented in this chapter draws on the methodological idea of tracing the implications of the actual and potential approaches (see Chapter 1). It is also important to analyze the more specific conditions and contexts that lead to particular implications in order to identify the more precise causal relationships between (i) the means for tackling divergent viewpoints as embodied in the nine approaches and (ii) their implications. The methodical challenge with these ideas is the difficulty of assembling empirical data that would allow us to capture the full scope of the implications. This limits our ability to conduct a full-fledged evaluation of the approaches discussed in this chapter; however, some lessons can still be drawn. In particular, we rely on the science-policy literature, which shows that certain approaches have had specific positive or negative implications in certain contexts, assuming that the contexts are comparable, to some degree, with the world of GEAs.

[7] E.g., "misunderstanding," "clarification," "delete," "avoid," or using explicit references to political decisions in GEAs, mentioning of committee activities, etc.
[8] See the literature references in the paragraphs on individual approaches in Section 5.3.
[9] The nine approaches are certainly not the only nor a comprehensive way to describe the existing variety of approaches.

For evaluating the approaches, it was explored if they helped meet the given GEA objectives (e.g., achieving a credible, policy-relevant, legitimate GEA process) without severe side effects (see Chapter 1). As it turns out, there is no one-size-fits-all approach to dealing with divergent viewpoints because certain approaches perform differently in different contexts. This makes it worthwhile to reflect on matching certain approaches with specific situations, i.e., to consider what conditions determine the appropriateness of a particular approach. This was achieved by drawing on the literature, conceptual reflections, and empirical evidence. Moreover, given some basic assumptions, logical considerations, such as hypothetical speculations with relatively high plausibility, lead to further hypotheses on the strengths and potential limitations of these nine approaches, as well as on the conditions leading to success and failure. The results are hypothetical at this stage of research and are by no means comprehensive. A full-fledged evaluation of the approaches requires further research that builds on the work presented here.

5.3 Results: different approaches in GEAs for responding to divergent viewpoints[10]

How do the selected GEAs respond to divergent viewpoints on policy options and the underlying definition of the problem? Nine different GEA approaches for responding to divergent viewpoints were identified. Table 5.1 summarizes the analysis of the nine identified approaches.

The first column of Table 1 enumerates and briefly describes the nine proposed approaches for responding to policy-related divergent viewpoints in GEAs. Approaches that build on hypotheses from the science-policy literature and were confirmed through the analysis of the empirical material (see Section 5.2) are indicated with "(Lit)." The different shades of blue in the first column represent different categories of GEA approaches. The order of the given categories of approaches in the GEAs for responding to divergent viewpoints is based on the (decreasing) extent to which a given category of approaches, under ideal conditions, allows the scientific experts (on their own) to resolve policy-related divergent viewpoints in GEAs (such a resolution is what GEAs mainly intend to achieve). In other words, the order of the approaches depends on the extent to which scientific experts in GEAs, under ideal conditions, can provide guidance (i.e., take a clear stand and settle controversial issues) on defining the political problem, setting policy goals, and deciding on the appropriate policy means. However, it would be a fallacy to interpret the order of GEA approaches in Table 1 as a normative ranking, i.e., as decreasing appropriateness of the approaches. Rather, as the analysis and argumentation in Sections 5.3 and 5.4 will show, the different categories of approaches are, under ideal conditions, particularly adequate for *different kinds* of divergent viewpoints that are varyingly difficult to resolve, *per se*. In that regard, several categories of GEA approaches can be roughly distinguished to better structure the empirical material:

- **The "no conflict" category** (white box in Table 1): The "clarify meaning" approach is routinely and successfully used by GEA experts and uses communication to overcome small misunderstandings. If this works, there is no real conflict from an *ex-post* perspective.

- **The "resolution by experts" category** (very light blue boxes): In the "knowledge" and "expert judgment" approaches substantial divergent viewpoints are resolved by scientific experts. This typically occurs within broader academic processes, such as peer reviews, and aims to establish a robust and credible consensus (knowledge), or strictly within GEAs, is often used when there is a lack of a broader scientific consensus and high uncertainty (expert judgment).

- **The "delegation to policy" category** (light blue boxes): In the "negotiated compromise" and "political decision" approaches, scientific experts at least partly delegate the resolution of some controversial issues to policymakers and other stakeholders and use the results to produce the GEA. In the "negotiated compromise" approach, the scientific experts can still play a relatively strong role in resolving the issue, while the experts actively delegate certain questions to policymakers in the "political decision" approach.

- **The "public deliberation" category** (blue boxes): This category refers to more long-term and extensive approaches where GEA processes do not necessarily (and certainly not in the short-term) resolve the divergent viewpoints at stake. Rather, GEAs envisage a constructive and broader public

[10] Kindly note that for the present version of this draft, the analysis of the empirical material is not yet finalized; we have so far focused on GEO-5-related interviews as well as IPCC documents. Thus, the results and discussions presented in this section are to be regarded as very preliminary hypotheses.

Figure 5.1. *Different approaches for responding to policy-related divergent viewpoints in GEAs. The first column describes the various approaches, while the different shades of blue indicate different categories of approaches along the decreasing role of experts to resolve the issues at stake (darker blue represents a weaker role). The second column enumerates the key examples of specific means to implement these general approaches. The third and fourth columns represent major preliminary hypotheses on positive and negative implications of the approaches. The final column explains the ideal conditions for a successful use of the approaches, again in terms of preliminary hypotheses.*

GEA approach to divergent viewpoints	**Different concrete GEA practices to realize the approach**	**Positive implications** (hypotheses)	**Negative implications** (hypotheses)	**Conditions for high appropriate-ness** (hypotheses)
(1) Clarify meaning – Communication and better explanation	Informal dialogues, formalized procedures, e.g., plenary sessions, responses to review	Low-hanging fruit for effective resolution; often facilitates learning	Limited potential if there is substantial disagreement	Lack of substantial disagreement, just misunderstandings, errors or individual lack of knowledge
(2) Knowledge (Lit) – Refer to credible scientific knowledge, or confidence level	Knowledge synthesis, peer review and consensus, initiate research if needed	Strong, credible, and widely accepted resolution, e.g., through consensus	Risk of "stealth issue advocate" through implied value judgments and uncertainty	Complex issues with only few disputed (implied) values and uncertainty
(3) Expert judgment – Hierarchy and authority	Informal or formal, discussion and argumentation, or decision by individual	Effectiveness and efficiency based on expert knowledge	Limited legitimacy and credibility if there are stronger disagreements	Less value-laden, disputed issues if there is no consensus, good CLA leadership
(4) Negotiated compromise – Between experts and policymakers	Informal or formal discussions during SPM negotiations, GEA review process	Accepted both by governments and scientists, time-efficient	Limited learning for the public and little legitimacy for the non-involved	If less publicly disputed and less complex, normative issues; fair dialogue
(5) Political decision (Lit) – Let policymakers decide (or majority vote); use results in GEAs	Decision either prior to or during (e.g., intergovernmental meeting) a GEA process, formalized and informal variants	Political buy-in and legitimacy through representation, time-efficient process	Conflicting issues are often difficult to separate from scientific knowledge	Not too many fundamental disputed issues, trust in governments, science at best delivers contextual information
(6) Public discussion (Lit) – Resolution, if at all, through political debate; limited role of the sciences	Formalized meeting or platform, informal long-term public debate (media, etc.), limited role of scientific experts	Much learning possible (though limited), highest legitimacy (if democratic and fair participation)	Knowledge gaps about viewpoint implications might impede potential resolutions, often unstructured	Fundamental disputed issues, science can at best deliver contextual information, fair participation
(7) Map implications (Lit) – Cartography of alternative policy paths, iteratively with stakeholders	Strong or weak stakeholder engagement, multi-scenario analyses or deep interdisciplinary "cartography"	Deep public learning exercise about political solution space without being policy-prescriptive	Significant effort, possible opposition, no clear recom-mendations, challenge of interdisciplinarity	Complex, disputed, fundamental issues, at least some scientific knowledge on implications, interdisciplinarity
(8) Revealed controversy – Capture different arguments and standpoints	Mapping conflicts in GEA report, other input to public debates by GEA experts, mapping ranges of results or probabilities	Opens up the debate, provides a conceptual framework and a "meta-narrative" to structure the debate	Not much learning regarding the potential solution to the conflict	If there is high scientific uncertainty and high policy-relevance and strongly disputed, if there has been no constructive political discussion yet
(9) Avoid (Lit) – Avoid heated issues, water down conflict	Postpone, water down the message, do not mention the topic, deletion during SPM negotiations	Allows for acceptance of at least of some insights	No contribution to society's heated debate, lack of policy relevance	Use if there is no chance for deliberation and the issue is too heated

discourse on these viewpoints (prior to, during, or after GEAs) to which GEAs then contribute either relatively little (public discussion) or a great deal (mapping implications, i.e., a scientific cartography of a broad range of implications of standpoints).

- **The "heated conflict" category** (dark blue boxes): This category comprises GEA approaches where divergent viewpoints are not resolved at all, but rather, where scientific experts either provide an overview of the controversial standpoints and contexts (revealed controversy), or avoid or water down the issues altogether (avoid).

The second column in Table 5.1 indicates the major means used to realize these strategies, in terms of concrete processes, institutions, actions, etc. The third and fourth columns enumerate the major hypotheses on the positive and negative effects of the approaches, based on the methods described in Section 5.2. The last column specifies the conditions under which the strengths of an approach particularly come to bear.

The elements of this table and the underlying rationale will be explained in the following sections. The respective examples given for the approaches, however, are only intended to be illustrative. The examples are, thus, not necessarily describing cases where the given approach was used and implemented in a *successful* manner and under ideal conditions. Rather, they represent examples of cases where this approach was employed independently from its appropriateness and outcome.

Approach 1: clarify meaning

This approach aims to resolve an existing disagreement in a relatively straightforward way by clarifying the precise meaning and background of a particular disputed statement or assumption in a GEA. The underlying assumption of this approach is that quite a few divergent viewpoints arise from mere misunderstandings, for example, due to the brevity of formulations, differing terminologies across scientific disciplines or other societal domains, a lack of individual knowledge, etc. Thus, these are pseudo divergent viewpoints that can be easily overcome by enhanced communication and explanation.

This strategy can be useful for all actors involved in a GEA process and can be used to mitigate disagreements between different actor categories (e.g., between scientists and policymakers) or within the same category (e.g., between authors), and theoretically, for all kinds of divergent viewpoints (see Section 5.2). Though rarely addressed by the science-policy models in the literature (Section 5.2), there is plenty of literature[11] in the field of STS that explains the conditions that lead to successful communication between different actors at the science-policy interface.

Several other precise methods, processes, and institutions have been used to achieve such improved communication, which can help overcome disagreements in GEA processes. These include informal dialogues between authors and policymakers during the SPM negotiations, responses by authors to review comments on their chapters, and formalized communication during GEA plenary sessions. While this approach emphasizes the existence of misunderstandings, there is a thin line between this approach and, for instance, the fourth approach discussed below (negotiated compromise), which emphasizes slightly altering standpoints, negotiation, and two-way learning. There is also a thin line between the knowledge, expert judgment, and public discussion approaches.

This first approach seems to be commonly employed in GEA processes, particularly for less disputed issues. Examples of this approach include:

(**1**) Our interviews suggest that misunderstandings between different scientific disciplines and communities (e.g., natural scientists versus policy analysts or scientists versus non-science stakeholders) have been overcome in GEA author teams through communication and explanation. Mutual learning about different perspectives was a commonly achieved outcome in the GEO-5 process, as illustrated by the following response from one of the GEO-5 authors who was responding to a question about whether there were divergent viewpoints and how they were dealt with:

> *"I mean, certainly working with people from a variety from different backgrounds, disciplines and countries. I think we all learned something, we all gained some capacities through the process."*

[11] Starting with Habermas (1971), an example for what clarification could look like is Hinkel (2011) who discusses the confusion around vulnerability indicators.

(**2**) Conflicts between authors as simple as misunderstandings in terms of non-native vocabulary and colloquial language, as the following response from a GEO-5 author exemplifies:

> *"There was a woman there and, I mean, I know that she means well, but she didn't understand the word robust so she wanted to supply the word rigorous. And she was saying no, no, no I don't understand, I don't understand, we should just put this word in; and all scientists were sitting there […] and say, well, they mean two completely different things."*

(**3**) According to interviews with participants, during the SPM negotiations for the IPCC WG III contribution to the AR5 (April 2014, Berlin), as well as during other GEA SPM negotiations (e.g., for GEO-5), the wording of the SPM draft was slightly altered in several cases as a response to government officials who had expressed concern about unclear and possibly misleading statements, or to minor careless mistakes. According to a GEO-5 author, misunderstanding between scientific experts and policymakers occurred during the review process as follows:

> *"I mean, certainly some of the comments that we got from governments and from reviewers in my mind just showed that they didn't understand what we were trying to say, and […] we had to be clear so we revised things."*

The clarify-meaning approach is low-hanging fruit for GEA processes, in that it can effectively resolve strongly policy-related divergent viewpoints with minimal effort or risk. In many cases, it also seems to imply a learning process for those involved about the issues at stake. This approach presupposes that there are many opportunities for exchange between different actors and actor groups within a GEA, which also involves high transaction costs.

However, for viewpoints that have substantial and more complex origins or foundations, this approach becomes more difficult to apply because it assumes that the misunderstanding, errors, or individual lack of knowledge are relatively simple to resolve. This approach has very limited potential to bring about beneficial results in more heated debates and in scientifically complex and disputed evaluations of long-term environmental policy options.

Approach 2: knowledge

The second approach, knowledge, is one of the most important notions at the science-policy interface and is precisely what many people typically expect from science-policy institutions, such as intergovernmental assessments. This approach aims to resolve, or significantly reduce, divergent viewpoints by pointing to reliable and credible scientific knowledge (typically in terms of facts, evidence and objectivity, which is in sharp contrast to subjective judgments, politics, etc.) that is widely accepted (or acceptable) in the scientific community. At a minimum, this approach can clarify and validate the confidence level in the scientific community regarding a disputed issue in a GEA (e.g., through quantifying the uncertainties and probabilities of future scenarios, see Sluijs et al., 2010). This approach is usually employed by GEA practitioners with the underlying assumption that certain divergent viewpoints can be resolved through better acknowledgment and integration of the existing scientific knowledge, or at least through scientific progress in the future because scientific knowledge is associated with authority and credibility in society.[12]

Depending on their philosophy of science, people have different opinions on the adequate implementation mechanisms for this knowledge strategy in GEAs because different opinions exist on what constitutes "reliable scientific knowledge." Consequently, alternative means to realize this approach include:

(a) A version that assumes that the science can make reliable, virtually undisputable recommendations for policy goals or means without making any disputable ethical value judgments if the appropriate method is employed (either by scientific publications that feed into GEA reports or, more rarely, by GEA writing teams themselves). Therefore, divergent viewpoints on policy options or underlying problems can best be solved by scientific experts alone and through their well-defined set of proven methods. For GEAs, this usually means synthesizing the most credible literature.[13]

[12] The huge body of STS literature, for example on the "technocratic" and "linear model" of science in policy and on scientific knowledge production (e.g., Bammé, 2009), explains and discusses central ideas and mechanisms related to this knowledge approach.

[13] However, as the number of scientific publications (e.g., on bioenergy) has increased rapidly in recent years, it becomes increasingly difficult to warrant a neutral and comprehensive overview of the existing literature in GEAs. New methods are needed to deal with the challenge of the exploding body of literature in some research fields (e.g., Grieneisen and Zhang, 2011).

(b) Another variant is the more moderate version, which acknowledges the relevance of ethical value judgments, as well as inevitable uncertainty of many scientific recommendations for public policy, but indicates that the knowledge approach can, nonetheless, work in situations where a widely accepted "consensus" on relevant ethical norms and uncertain scientific issues can be assumed (Sluijs et al., 2010; Edenhofer and Kowarsch, 2014). This consensus can be identified, for instance, by reviewing and synthesizing the literature.

If there is no full resolution, both variants can be used to establish scientific confidence. Moreover, both alternatives typically emphasize the scientific peer review process as an important instrument to achieve scientific confidence. Scientific peer review is certainly among the most important and successful means to achieve new and widely accepted scientific knowledge. GEA reports are typically built on peer-reviewed literature, but they also use review processes to ensure the scientific quality of their own statements. This double emphasis on the scientific peer review process is a key instrument for implementing the knowledge approach in GEA practices.

If there is remaining disagreement in the scientific community, one option is to initiate future research to fill the knowledge gaps and overcome uncertainty. GEAs can do this by indicating research gaps in the GEA chapters (as explicitly demonstrated in the GEO-5 and IPCC WG III AR5 chapters) and by providing incentives for research communities to address the research gaps (see Chapter 4).

The knowledge approach is a widely used approach in GEAs that responds to divergent viewpoints labeled as "scientific," i.e., those that are not regarded as overly value laden. Numerous examples exist in GEAs:

- One of the key messages of the IPCC WG III AR4 report was that the long-term global economic costs of ambitious global climate change mitigation targets were relatively moderate under ideal conditions.[14] This message built on the knowledge approach. Moreover, a large number of model numeric analyses that employed integrated economic-technological-climatic assessment models were generated to underpin this finding. This effort aimed to resolve the key climate political dispute regarding whether ambitious global climate policies were economically costly or not.
- A number of responses from different GEA authors further illustrate the knowledge approach:

> *"Now, do we just make recommendations based on what the governments wants to hear or on what we think is best in terms of, based on evidence, what we think the best approach is in terms of improving environmental sustainability. I think that the GEO process has to go with that option, has to recognize that sometimes the options will be difficult, choices will be difficult but we have to, as a knowledge organization or as a knowledge process, be able to make recommendations."*
>
> *"Well I think the intention to really get objective information, so the intention to get an objective document which just summarizes our situation. Summarizes the situation of a different part of the environment, about their state, about their trends, and about possible solutions to deal with them."*
>
> *"So, I think first of all try to separate politics from research…think it should be important that GEO-5 should not be a political document…. That it should not be a political document, but it should be a statistic, a description of what is that we have, what are possible solutions and then politicians can use these documents to put priorities and the priorities and to make decisions to say, ok these are for us the most important urgent issues."*

The following response from an interview with a GEO-5 author highlights the idea of identifying the scientific confidence level:

> *"Yes, I think you should definitely…try to give it balance as well, because if 90% of scientists say A and 10% of scientists say B, then you might reflect both of the points of view, but indicated clearly that 80% or 90% of the scientists support option A."*

The knowledge approach is crucial for tackling divergent viewpoints at the science-policy interface. Throughout history, scientific progress has helped to resolve a

[14] See Table SPM.6. This message was also supported by the popular Stern Review (see Stern, 2007).

plethora of divergent viewpoints. The knowledge approach is an effective tool because it has enough scientific rigor to resolve complex, open questions. However, it can be an onerous and time-consuming process that is dependent on scientific progress and wide acceptance of specific evidence across the entire scientific community. More importantly, this approach can be misused or misrepresented as a "legitimation model" or a "stealth issue advocate" model (Pielke, 2007), as the STS literature has highlighted in recent years with plenty of concrete examples. Under the guise of accepted (legitimate) scientific authority—a crucial precondition for the effectiveness of the knowledge approach—and alleged scientific consensus and certainty, scientists and policymakers can promote their own interests and specific points of view in an opaque and sometimes questionable manner (Habermas, 1971; Jasanoff, 1990, 1998; Funtowicz and Ravetz, 1990; Pielke, 2007; Edenhofer and Kowarsch, 2014). This is achieved through the use of opaque uncertainty or implied value judgments that are not made transparent, but frequently occur in policy-relevant science.[15] As a hypothetical example, integrated assessment models (IAMs) used to calculate global and regional economic cost estimates for ambitious climate policy pathways, which inevitably implied several normative assumptions (Schneider, 1997; DeCanio, 2003; Ackerman et al., 2009; Beckerman, 2011; Tavoni and Tol, 2010), such as fair distribution of wealth and goods. If such disputed assumptions underlying the IAM results had not been made transparent in the studies or GEAs, one could have easily misinterpreted the results with implications for climate policy and other political standpoints.[16] The knowledge approach can even intensify political controversies instead of resolving them, as many studies have sown (see especially Sarewitz, 2004).

Despite its merits in so many cases that presuppose a relatively well-functioning, fair, credible, and transparent scientific peer-review system, the risks associated with the knowledge approach is particularly high when there is a strong, implied conflict over the ethical issues or interests that underlie the divergent viewpoints (see Gupta et al., 2012). In these cases, science has little chance of reconciling policy-related divergent viewpoints using the standard tools that are at the core of the knowledge approach.[17] A hypothetical example is an attempt to resolve the issue of anthropogenic climate change through an increased scientific consensus on climate physics that ignores the many underlying political dimensions (Sarewitz, 2004; Pielke; 2007; Hulme, 2009). Thus, the knowledge approach is particularly strong if there are scientifically complex divergent viewpoints with limited ethical disputes or conflicts of interests, and limited uncertainty that can at least be partly overcome.

Approach 3: expert judgment

The third approach, called expert judgment, is similar to the knowledge approach, but scientific experts are the ones who are attempting to resolve the divergent viewpoints. This strategy of responding to policy-related divergent viewpoints is exclusively handled by GEA writing team. In contrast to the knowledge approach, however, it does not necessarily include the entire scientific community, nor a larger consensus-seeking process, but rather, a relatively narrow pool of authors and experts attempt to resolve the controversial issue through their own means. The underlying assumption of this strategy is that during a GEA process, hundreds of decisions have to be made by author teams, GEA experts, and producers; therefore, expert judgments are a more efficient (time-saving) and largely reliable way of dealing with the sheer volume of potential instances where scientific consensus can not be reached.[18] In contrast to the knowledge approach, expert judgment builds on the scientific authority, hierarchy, and credibility of those who resolve the divergent viewpoints (be it individuals or teams), mainly because no scientific consensus exists. The expert judgment approach is mostly employed in an informal manner during the writing process, but can also occur through more explicit and structured modalities, such as special committees or official production meetings for CLAs. Variations of this modality include (1) cases where CLAs, assessment chairs, coordinators, or other stakeholders with leadership functions in the GEA process take authoritative decisions as individuals (or as committees) and (2) more frequently, cases where GEA writing and production teams jointly discuss disputed issues in meetings (face-to-face or virtually), and then come to a deliberated agreement or compromise within the group. Some STS literature describes (usually in non-GEA contexts) how expert teams arrive at their decisions and key messages through such approaches (e.g., Noble 2004).

[15] An example from an interview with a GEA author illustrates this pitfall: "I think this view that science is impartial and a-political and that science is free when it comes to resolving disputable knowledge, I think that that's [um] an out-of-date perspective and also one that is quite naïve; and yet, ironically, I found myself falling back on the, those kind of arguments when it came to, like, this dispute with the government…. It's like: 'ok, well, science says…'"

[16] An example may be the presentation of the future energy mix scenario (based on IAM calculations) in the IPCC WG III AR4 report (see Figure 4.25 in IPCC, 2007, p. 290). Without careful examination, the reader may assume that there is only one scientifically reasonable future energy mix that can mitigate climate change, which is certainly wrong.

[17] A misguided use of the knowledge approach also works the other way around: It can be used by policymakers as a strategy to delay political action in cases that are complex and uncertain, because it may take a very long time to achieve scientific consensus (if at all). Without such a consensus, policymakers can argue that there is no need to act.

[18] Or in cases where there is no clear political decision (such as, for instance, on disputed policy priorities or on evaluative criteria).

Expert judgment is often used to resolve divergent viewpoints in the GEA process. In our interviews with GEA authors, several of them reported cases that clearly belonged to this category. In most cases, the divergent viewpoints concerned priorities (i.e., which topics or sub-aspects to include or not). Since this implies judgments about whether or not a certain issue is to be regarded as an urgent problem, this type of divergent viewpoint is clearly normative and, if it is about policy priorities, is clearly policy-related in the sense defined above (Section 5.2). Statements from the interviews that highlight the expert judgment approach include:

"I didn't think consensus was necessarily to be the ultimate aim…. I think it is the ultimate aim, do you want kind of consensus somehow with the group, that people agreed to what they were writing, and I think we did achieved that."

"Everybody wanted what they thought was important whether it was energy or soil or land or whatever and so I remember there just being this argument about the table but I mean, again it was a relatively constructive argument and I know some things that I wanted to put in there were not put in but I accept that and, as I said, it was quite constructive."

"I didn't think consensus was necessarily to be the ultimate aim…. I think it is the ultimate aim, do you want kind of consensus somehow with the group, that people agreed to what they were writing, and I think we did achieved that."

"I think that in our case, it was resolved reasonably well. We…had a good coordinating lead author that tried to get a balance within this different types of…information, and…the final chapter you can see that all views are reflected in the chapter."

An additional example is the GEO-5 Science and Policy Advisory Board, which was mandated to "make the final determination on any science related contentious issue as raised by CLAs, the Secretariat or expert reviewers." Furthermore, the Science and Policy Advisory Board, composed of reputable scientific and policy experts, was tasked with supporting the GEO-5 process by providing scientific quality assurance to chapter authors and, in "cases of uncertainty and/or contentious science related issues, the board will provide the final determination."[19] The expert judgment approach is highly efficient and can be credible given that the decision-makers in this case are experts. However, it can also lack credibility and legitimacy if the viewpoints are more severely disputed and value laden, for example, in complex environmental policy assessment situations of strong trade-offs between valued objectives, such as economic growth and environmental quality. Since these policy issues affect almost all people on earth, a GEA that relies strongly on this approach might be perceived as less than credible, either by policymakers or other stakeholders (Sarewitz, 2004). These challenges were evident in a number of interview statements:

"I think there is a balance, you know, that because consensus within the group is not necessarily the kind of the final [um] perfect outcome necessarily, because it's a broader experience to draw on, kind of other aspects in sort of deciding what important issues are and being able to have that in context."

"So I was able to go over some of the stuff that other people felt it just didn't read right…. So I did that a bit…and then when GEO-5 came along, I actually got messages from people…saying that they really wished I was around because there wasn't a lot of that critical thinking, there was just a lot of, you know, team cheerleading going on."

"The whole process…of selecting who will be, I think to me that's actually the most key, because a lot of what you see with this report is very much a function of one or two people that were on those chapters that, so which makes sense, but many times those one or two people aren't necessarily the people with the best intentions or the most interest in seeing the best product come out."

"I had written up a couple of pages that I was hoping they would include, which they didn't. And so, I don't know. Different priorities, I guess.

"The issue of invasive species and especially of aquatic invasive species was not important to any particular individuals on that chapter, then that was what falls through the cracks."

[19] Source: UNEP document "Guidelines for Ensuring Scientific Credibility and Policy Relevance of the GEO-5 Assessment".

"So, I think first of all try to separate politics from research…think it should be important that GEO-5 should not be a political document…. That it should not be a political document, but it should be a statistic, a description of what is that we have, what are possible solutions and then politicians can use these documents to put priorities and the priorities and to make decisions to say, ok these are for us the most important urgent issues."

The optimal conditions for the expert judgment approach, thus, are those where divergent viewpoints are not highly disputed, not overly complex, and not directly (or normatively) about the evaluation of policy options (and, as such, not too fundamental), and where there is no scientific consensus. If one of these criteria is not fulfilled, this approach could lack legitimacy and credibility. Moreover, this approach seems to presuppose the existence of good leadership of CLAs and other actors in the GEA writing and production teams, as well as the willingness and capacity of scientific experts to have a fair and rational discussion within their teams.

Approach 4: negotiated compromise

The fourth strategy, negotiated compromise, is the first one belonging to the "delegation to policy" category of approaches. This approach is somewhat similar to the expert judgment approach in that it relies on internal GEA negotiations and decision-making approaches. In contrast to the expert judgment approach, however, this approach tries to build a bridge between GEA authors and experts on the one hand, and a group of policymakers and other stakeholders that are somehow involved in the GEA process on the other hand (see Chapter 6).

The basic idea is to bridge science and policy through a direct exchange of arguments within the GEA process, which may, ideally, lead to a compromise that is acceptable for all of the parties involved (e.g., the "honest broker" model in Pielke, 2007). A decisive underlying assumption seems to be that such a direct dialogue and negotiation is necessary at the science-policy interface to overcome the barriers and different priorities and perspectives that exist between groups of scientists and policymakers. This approach is frequently employed informally (e.g., through talks during breaks at GEA meetings, or simply through phone calls), but also often occurs within specific, formalized GEA procedures (e.g., the SPM approval procedure) and committees in which a small number of selected GEA authors, experts, policymakers, and other stakeholders negotiate. One could also think about engaging a mediator for such an approach. There is significant potential overlap with the first approach (clarify meaning) and the ninth approach (avoid, as described below), and is mildly similar to the expert judgment approach.

This approach is frequently used in GEAs to respond to divergent viewpoints. Obvious examples include the formal SPM (or "SDM") approval procedure that is part of many GEAs,[20] informal discussions during these approval meetings, or government reviews of GEA report drafts (such as with the IPCC). Fortunately, some GEA SPM processes are well documented. These documents provide examples of this negotiated compromise approach (see IISD [2014] and Edenhofer and Minx [2014] for the IPCC WG III AR5 SPM and IISD [2012] for the GEO-5 SPM approval meeting). For further examples and discussions on this approach, see Chapter 6. Examples from the interviews supporting this approach include:

"We had one from China but it was so small, it was just fine, we'll just change it, it wasn't a big deal…they didn't like the way we portrayed something…. There were some comments that were kind of annoying, but for the most part, we were able to either make a change that would resolve it or write a response that we felt like addresses things."

"There is also a resolution acknowledging the GEO-4 exists, and that was negotiated in Monaco, but there the United State didn't want any reference to the main body of GEO-4 because they said that has not been negotiated, that's independent by researchers we don't accept all outcomes; we only want to refer to the summary for policy makers that we even negotiated and agreed to."

[20] To some extent, the SPM process also applies to the knowledge and other approaches. As mentioned in Section 5.2, several approaches are often used simultaneously to respond to divergent viewpoints in GEAs.

> *"I had had with my chapter, with the two rounds of governmental review, huge battles with Brazil about how we represent the case…and they had sent this text, but it wasn't backed up by literature that my colleagues thought was appropriate. We finally agreed to texts on deforestation, there was no way on this planet that I would now change that text again so it would be published with something that I had not agreed to with the Brazilian colleagues."*

The negotiated compromise approach, as "boundary work" at the science-policy interface, is strong regarding the involvement of policymakers and stakeholders. This approach could lead to enhanced communication between science and policy and possibly stronger acceptance of GEA results by governments (see Chapter 6). The communication between these groups can be beneficial in several ways, and there is ample literature concerning the characteristics of and the need for such boundary work at the science-policy interface (e.g., Cash et al. 2003).[21] Not only is it efficient, but the negotiated compromises may be acceptable for both the scientific and political realms.

On the other hand, this strategy could be used by governments to pressure authors or, conversely, scientific experts could use it to influence policymakers. Though negotiating a compromise can also lead to learning about environmental policy options and the underlying problems for those involved, these effects are naturally limited (compared to other approaches). This is because the approach emphasizes negotiation and compromise rather than a thorough and extensive scientific exploration of the issues at stake. Moreover, the legitimacy of this approach is weak from the perspective of those who are not involved.

This approach may work particularly well if the issues at stake are less complex and more normative in society. Additionally, this approach will rarely lead to a sustainable resolution of policy-related divergent viewpoints if there is no fair dialogue between the authors and policymakers. This means that if the governments have a very strong influence over the statements in the GEA reports and put pressure on the writing and production teams, it essentially becomes a variant of the political decision approach discussed below.[22]

Approach 5: political decision

The previous approach outsourced the resolution of the divergent viewpoints to committees or informal settings where authors, GEA producers, and policymakers were all included in the deliberation of the formulations. The fifth approach, political decision, delegates completely the resolution of controversial issues to the political realm, perhaps because writing teams regard it as appropriate to delegate certain divergent viewpoints to policymakers. Alternatively, governments can simply exert their (legitimate or disputable) power as a major stakeholder group in the GEA process. In this approach, governments, policymakers, parliaments, and other political decision-making bodies make decisions regarding disputed viewpoints, and then build on that decision in their analyses of environmental problems and solutions.

Once a political decision has been made, a GEA can (and often does) refer to it as a given starting point for analysis in the GEA report (e.g., the UNFCCC decisions and declarations referred to by the IPCC assessment reports). The major underlying assumption is that, for democratic reasons, highly normative, value-laden divergent viewpoints in GEAs can only be resolved by policymakers and not by scientists. Policymakers can make decisions,[23] for instance, through (1) general political processes prior to a GEA process, (2) within a GEA process in a formalized setting (e.g., an intergovernmental meeting on GEAs) and (3) in informal ways. There is a thin line between this approach and the sixth one (public discussion); and there is a close relationship with the negotiated compromise and avoid approaches.

The most illustrative example of this approach usually occurs during the scoping stage of the GEA when policymakers ask scientists to analyze certain questions and to omit others. Without such decisions, the writing teams themselves would need to resolve which themes and topics should be included and excluded in the GEAs.

[21] Policy relevance and legitimacy—from the perspective of governments—can be improved through such an approach, as one would assume.

[22] Another interview with a GEO-5 author showed how problematic this approach can be, particularly if institutional interests come into play: "We already just talked about it in terms of, like, resolving differences of opinions with authors, but then there is this whole other layer of basically governments fund UNEP and UNEP commissions and coordinates GEO and then GEO is supposed to give advice to governments. But it has to be an advice that governments are at least slightly receptive to hearing or else it threatens the future of the whole loop. And so then there were conflicts that in later with governments' review process first of all and also outside of the review process with governments contesting or challenging or wanting to de-emphasize some points that were in the report points."

[23] Again, these "decisions" can vary greatly. In other words, they can have very different legal and political meanings.

Another example is the High-Level Intergovernmental Advisory Panel for GEO-5 that had the task of specifying the policy goals and priorities to be analyzed in certain parts of the GEO-5 (though there was still some leeway for the writing teams): "Establish a High-Level Intergovernmental Advisory Panel with adequate representation from all regions to identify relevant internationally agreed goals for Part 1 and provide guidance to chapter authors in Parts 1, 2 and 3 in their consideration of goals and policies. Furthermore, the Panel will consult with lead authors and advise on the Summary for Policy Makers (SPM). The Panel will be comprised of high-level policy experts from government."[24] An interviewee commented on this panel: "There wasn't even one single instance that the authors did not agree with the recommendations set forward by the advisory panel and no, no divergence…. All the solutions fit for the areas and for the regions, of course, because the high level advisory panels were geographically distributed, being more informed and more in-depth about the priorities of their own region."

Besides being relatively time-efficient and well-aligned with the interests of governments, this approach is particularly useful for (1) creating the ownership and "buy-in" of governments and (2) delegating the resolution of highly normative political issues to policymakers as the bearers of political legitimacy, which they derive from political representation or other means.

One negative consequence of this approach is that it does not help to better understanding the specific pros and cons of alternative environmental policy options or problem definitions. It runs the risk of wrongly assuming that science cannot contribute much to discussions about policy objectives and other highly normative issues in environmental policy. However, there are good reasons to disagree with this perspective, as argued by Edenhofer and Kowarsch (2014), and as suggested by the map implications approach below.

The debate over the 2°C goal in global climate policy (or in setting national climate mitigation objectives) offers an illustration: Arguing that decisions about what level of climate policy to adopt should ultimately rest with policymakers (not with scientists) will usually garner much support. However, without reliable scientific information about the implications of alternative decisions, policymakers cannot make independent decisions. By contrast, science might inform policymakers and the public about the expected implications of alternative mitigation pathways with respect to multiple societal objectives. Finally, in extreme cases, resorting to this approach might theoretically lead to questionable domination of others by more powerful actors.

The interviews revealed some of the pitfalls and risks of the political decision approach. One interviewee talked about powerful governments: *"They wanted control of the…overall outcome."* Another interviewee stated that a governmental representative:

> *"had an extraordinary impact on the GEO report, you know, he went to all the advisory meetings and it just shouldn't be done that way, so there's got to be some way to neutralize personalities so that, you know, scientific process is not driven by, you know, who shows up in the room."*

The ideal conditions for the political decision approach are that scientists do no contribute much (at best: some context information) to resolving the issue, and the divergent viewpoints are highly normative and disputed, but not so fundamental that they cannot be resolved at all. Trust in political decision-makers will also increase the acceptability and legitimacy of this approach.

Approach 6: public discussion

The public discussion approach, as part of the public deliberation category of approaches, differs from the previous approaches in that there is not necessarily a resolution to the divergent viewpoints, at least not in the short term. This a long-term approach that is among the more complex and extensive approaches for responding to divergent viewpoints. It envisages a constructive and broad public discourse on the divergent viewpoints prior to, during, or after the GEA process. Science can play a role in such public discussions by providing background information and inputs in an iterative process; but its role remains limited. The key assumption is that it is possible to resolve divergent viewpoints, sooner or later, through a constructive and fair democratic discourse where science is not expected to contribute very much to the resolutions, which are usually assumed to be

[24] UNEP document, "Guidelines for ensuring Scientific Credibility and Policy Relevance of the GEO-5 Assessment."

highly normative and value-laden.[25] This approach largely operates outside of the GEA process and the GEA writing and production teams. However, besides informing these debates, GEAs can deliberately draw on the results and agreements from earlier public discussions, as well as actively initiate new public discussions by proposing to delegate the disputed issues to public discussion.

This approach can be implemented via public debates using various formats that range from informal conversations, to organized meetings, to platforms, to dialogue forums (i.e., public consultations), to the mass media, and so on. Moreover, if science plays a stronger role in such public debates, there may be overlaps with the negotiated compromise approach, the political decision approach, the map implications approach, and the revealed controversy approach.

Examples include the regional consultations organized by GEO-5, which are discussed extensively in Chapter 6. Other examples include the IPBES practice of having several multi-stakeholder consultations where divergent viewpoints on content-related issues (priorities, evaluative criteria, etc.) were openly discussed.[26] Other examples for this approach also required broader societal debates that took years or even decades to resolve, often involving heated public debate. The German debate over nuclear phase-out is a case in point: It lasted several decades, was intense and societally divisive at times, but eventually resulted in the broadly supported decision to abandon nuclear power (Economist, 2012).

This approach is not used intentionally very often because it requires that facilitation of large-scale public debates. However, there is some literature on science-policy models that recommend this approach for responding to divergent viewpoints (Habermas, 1971; Hulme, 2009; etc.).

The public discussion approach has considerable advantages, despite the obvious drawback of being time consuming, costly, and unpredictable in its outcomes for all parties. The most important positive effect is the high level of legitimacy if fair and democratic participation can be ensured. Over time, public discussion can foster a far-reaching learning process in society, as well as a steady adjustment of preferences. However, assuming that science plays only a very weak role, this approach tends to underappreciate the potential role of science in contributing to complex problem solving and even heated political debates (see map implications approach). For example, gaps in knowledge about the future implications of adopting a certain viewpoint might impede the resolution of a conflict, but these gaps could reveal themselves once the contending parties become better informed. Furthermore, such public discussions might be relatively unstructured and, therefore, lack efficiency.

Ideal conditions for this approach seem to be given if the issues at stake are highly value-laden and fundamental to policy processes, disputed and if science cannot deliver much due to high uncertainty etc.

Approach 7: map implications

In the map implications approach, scientific experts involved in GEAs play an active role in informing public deliberation processes, but do not directly resolve divergent viewpoints. Rather, the divergent viewpoints are analyzed by employing scientific analyses in view of their future implications. To enhance the relevance of such inquiries, these analyses can be conducted through deliberation with stakeholders and the public in a cooperative and iterative manner as co-production (Jasanoff, 1990). The assumption behind this pragmatist strategy[27] is that the public can make more informed decisions if they have a better understanding of the implications of alternative policy pathways.[28] This ambitious approach requires "cartography of the political solution space," and can be realized to different degrees. Multi-scenario analyses and interdisciplinary impact assessments, which have already been employed in GEAs for a long time, come closest to this approach. Full realization would include exploration of the quantitative and qualitative implications of the disputed policy options (or problem descriptions). There can be overlap with the public discussion and revealed controversy approaches.

Though the basic underlying idea of this approach is quite old (multi-scenario analyses, tracing implications of policy options), it is relatively novel because it has rarely been employed in GEAs. A prominent example is the map implications strategy that was used in the IPCC WG III to some extent (Edenhofer, 2012; IPCC, 2014, Preface; Edenhofer and Minx 2014). In a special report (SRREN, see IPCC, 2011, p. 59, Fig. TS.2.9), the IPCC provided an overview of alternative, disputed

[25] See the literature in the field of STS studies on the elaboration of Habermas' pragmatic or "democratic" model (Maasen and Weingart, 2005).
[26] See documents on www.ipbes.net.
[27] This is described and explained in more detail by Edenhofer and Kowarsch (2014).
[28] This can include analysis of (1) direct effects, (2) secondary effects, (3) unwanted side effects, and (4) co-benefits of policy options or business-as-usual pathways.

narratives regarding future bioenergy use. Some of the implications of each pathway were explored. Moreover, instead of recommending a specific climate mitigation goal or avoiding disputed political issues, the recent IPCC WG III report (IPCC, 2014) explored the implications of alternative ambition levels for climate mitigation, adopting a multi-metric perspective (see Edenhofer and Minx, 2014). For this purpose, sophisticated multi-scenario analyses were conducted that explore the implications of alternative policies, timings, delays, and metrics, as well as technological and other assumptions for climate policy in general and specific sectors.[29] Some of the potential co-benefits of ambitious climate policies were analyzed in detail (IPCC, 2014, Chap. 6) to better understand the political solution space. One interviewee offered a view that is similar to the map implications approach:

> *"I think that for the big challenges that we face there are no easy, quick solutions and so what's most important is, discovering effective mechanisms that can unite diverse groups, you know, lasting, you know, sustained manner that can succeed at uncovering pathways, you know, towards effective solutions that have this joint ability to take into account, you know, the facts, the science, as well as to, to be politically viable. And so, you know, I think, one of the examples where that has worked effectively is the, the European transboundary air pollution case, whereas, you know, today it's just almost routine and so people don't even think about it too much but, you know, the 80s and 90s it was very politicized and, you know, people either because they were very smart or very lucky or a little of each, you know, they, they figured out assessment processes that, that had all those characteristics that I am talking about. They were viable over the long run, they permitted political compromise to take place in a way that was grounded in the science but it was politicized enough that it actually worked, you know, it was, wasn't just scientists screaming at people to do the right thing. It was scientists, you know, working in a long-term basis to understand the constraints that politicians have and helping them steer in a new direction. You know for the big, you know, for biodiversity, water, climate, energy, I don't think we figured out yet, mechanisms that have those characteristics, so that, that transboundary air pollution case is one that fits. I think in the health arena you can find others, you know, like the community that's mobilizing to eradicate polio or control malaria, you know, you have similar kinds of fusions of these, these different kinds of perspectives and interests that have proven capable of sustaining themselves on, you know, a multi-decade timeframe."*

This approach emphasizes the need for a broad, open, participatory debate about these value-laden and disputed issues, but also gives science a strong role as cartographers (not navigators) of the political solution space. Though mapping implications is not policy-prescriptive (because alternatives are explored), it can strongly support and inform public debates about controversial issues by explaining the conditions, trade-offs, overlaps, synergies, winners, and losers of and between policy pathways. Sometimes (in less complex and uncertain cases), this transparent and trans-disciplinary exercise can indirectly reveal that certain paths are preferable over others.

Edenhofer and Minx (2014) suggest another challenge. They argue that this approach came under attack by governments through the *ex-post* policy evaluations of past emissions trends, as well as international cooperation issues during the IPCC AR5 WGIII SPM negotiations due to their adverse political implications for some governments. In a similar vein one interviewee stated:

> *"Countries don't like to be ranked, particularly when they negatively ranked them…. Countries don't like to have failures identified and in some other, the best lesson to come out of policy analysis come out of failed policies."*

Another main challenge associated with this approach is that it is highly resource-intensive because significant inter- and trans-disciplinary cooperation is required, and the policy issues at stake tend to be large-scale and complex. Moreover, this approach does not necessarily result in clear-cut policy recommendations. However, whether this is regarded as a vice or a virtue depends on the preferred science-policy model.

[29] See, e.g., http://www.feem-project.net/limits/ and http://ampere-project.eu.

Therefore, this approach appears to be promising, particularly for the highly complex, value-laden, and disputed cases of divergent viewpoints. If interdisciplinary cooperation can be fostered, stakeholders are successfully engaged (see Chapter 6), and if at least some scientific knowledge is available on the implications of policy options, this might be a promising approach to be adopted by future GEAs.

Approach 8: revealed controversy

The next strategy, revealed controversy, belongs to the heated conflict category. It differs from the previous approach in that GEAs do not explore the implications but, rather, attempt to clearly delineate the divergent viewpoints. In contrast to the public deliberation category, it is not assumed that the divergent viewpoints can be resolved. The assumption, however, is that the exercise of mapping the conflict and the related standpoints may at least help structure the public debate, particularly in cases where not much scientific knowledge is available to support the debates or where uncertainty is very high. This approach can be realized through a direct mapping of the conflict in the GEA report (or by explaining the ranges of the results and probabilities; or via footnotes in the SPM where unresolvable disagreements between governments are mentioned), as well as through input (oral, media, or presentations) by GEA researchers to public debates. Moreover, this approach can differ depending on whether or not external stakeholders are strongly included. Although there can be a very strong overlap with the map implications approach, this approach is a strategy on its own because the idea of evaluating and possibly revising the policy options (including policy objectives) based on their implications is quite different from merely mapping the existing controversy. The literature that describes the revealed controversy strategy includes Hulme (2009), Robert and Zeckhauser (2010) on the case of climate policy, Campbell (2002), Urhammer and Røpke (2013), and IISD (2013), which analyzes the divergent policy narratives of various environmental policies.

There are an increasing number of examples for this approach in contemporary GEAs, perhaps because the focus on consensus in GEAs has decreased (Sluijs et al., 2010). An interesting case is a UNEP document on GEA strategy that emphasizes this approach more than any other:[30]

> *"Inclusion of divergent viewpoints:*
> *Identifying science and policy-related contentious issues, where different viewpoints exist, will be the responsibility of the Coordinating Lead Authors, as well as the Reviewer Editors.*
>
> *Assessments should describe different, possibly controversial, scientific, technical, and socio-economic views on a given subject, particularly if they are relevant to the policy debate.*
>
> *Coordinating Lead Authors and Lead Authors should explicitly document in the assessment where a range of viewpoints around data, science and policies have been considered, and Coordinating Lead Authors and Review Editors should satisfy themselves that due consideration was given to properly document alternative views.*
>
> *In preparing the first draft of an assessment report and at subsequent stages of revision after review, authors should clearly identify disparate views for which there is significant scientific, technical or socio economic support, together with the relevant arguments. Sources of uncertainty should be clearly identified, listed and quantified where possible. The implications for decision-making of the findings, including knowledge gaps, contrasting evidence and minority opinions, should be explicitly discussed.*
>
> *Coordinating Lead Authors are required to record views that cannot be reconciled with a consensus view but that are, nonetheless, scientifically, technically or socio-economically valid. Consensus does not imply a single view, but can incorporate a range of views based on the evidence.*
> *If necessary, with guidance from the Scientific Advisory Panel, the assessment report may include in a footnote the differing views expressed in comments submitted by Governments during their final review of the document if these are not otherwise adequately reflected in the paper."*

GEAs informing the public about the controversy at stake and the different arguments put forward may be valuable for handling stagnant public debates.

[29] "Proposed procedures to enhance future assessment processes: Report by the Executive Director," UNEP/EA.1/INF/14, 2014.

This would open up debates instead of closing them down too quickly (Stirling, 2008), which can provide a meta-narrative for discussing divergent viewpoints more constructively. However, the lack of a scientific exploration of the implications for policy options obviously reduces the learning potential for the issues at stake.

The revealed controversy approach makes particular sense if the issues at stake are highly uncertain (i.e., science cannot deliver a map of the solution space) and disputed, or if there is very limited political will to constructively discuss the divergent viewpoints.

Approach 9: avoid

Finally, the avoid strategy is used by GEA experts and producers, as well as authors and author teams, to avoid or at least strongly water down the divergent viewpoints in GEAs, particularly the most heated and politicized ones. Policymakers also sometimes insist on avoiding certain issues in GEAs. The idea behind this strategy is that, in some cases, it is wise to avoid the most heated issues in order to come to a consensus or at least an agreement on other important messages and results. This approach can be realized in different ways, including formal and informal ones. During the mandating process and SPM negotiations, avoidance of certain statements or topics is sometimes negotiated between authors, experts, and policymakers, for instance, by deleting certain topics or statements from the SPM drafts.[31] Avoidance can also happen on a smaller scale, i.e., within a GEA chapter or author team if there is no agreement among the authors themselves. Avoiding heated issues can mean being absolutely silent about an issue or watering down the most heated aspects of it. It can also mean simply postponing the discussion until a later stage (e.g., the next GEA cycle in the case of recurring GEAs) when more scientific knowledge is available or when the political debate is less heated. There can be strong overlap with the negotiated compromise and political decision approaches.

This approach is used often (see Siebenhüner, 2003) in different ways. An obvious example is the IPCC WG III AR5 SPM negotiations (see Edenhofer and Minx, 2014, and Stavins, 2014) where the governments insisted on deleting certain paragraphs and figures from the SPM draft because the underlying divergent viewpoints could not be resolved. For instance, as Edenhofer and Minx (2014) explain, the country classifications for the AR5 ex-post assessment of progress in climate change mitigation had immediate relevance for political negotiations, resulting in the fact that governments objected and the figures and associated text were removed from the SPM. Governments' concerns over the grouping of countries arose despite efforts to provide a balanced assessment of how emissions have grown as countries developed and how these patterns have shifted over time. The fear of some governments was that approval of any country classification other than the one currently used in the negotiations could be disadvantageous in upcoming negotiations for a new international climate regime. Another example for governments' concerns with ex-post evaluation of their policies was the fact that some governments felt uncomfortable with certain AR5 sections on the performance of the European ETS.[32]

In this sense, the SPM negotiations can be regarded as an example of the negotiated compromise approach, but other approaches also come into play within these negotiations.

Both the positive and negative aspects of the avoid approach seem relatively obvious. Not addressing an issue or watering it down has the potential to foster public debate; therefore, it may result in a lack of policy relevance. On the other hand, it can be the "lesser of two evils" if such a strategy at least allows for a constructive discussion and acceptance of other, less heated issues in GEAs (see Siebenhüner, 2003).

The ideal condition for this approach is when there is no chance for constructive deliberation (at that particular point in time) because the issues, and possibly the circumstances surrounding the issues, are simply too heated.

5.4 Discussion

The remaining, and perhaps most interesting, question is how future GEAs might actually improve their approaches for responding to policy-related divergent viewpoints. This can be clarified analyzing and comparing the conditions for success for each approach. An analysis of their respective conditions for success showed that there is a correlation between:

(1) The decreasing extent to which scientific experts autonomously resolve divergent viewpoints in GEAs through these approaches;

[31] See IISD (2014) and Edenhofer and Minx (2014) for the IPCC WG III AR5 SPM, as well as IISD (2012) for the GEO-5 SPM approval meeting.
[32] See, e.g., http://www.welt.de/print/wams/wirtschaft/article128129440/Die-Klimatrickser.html.

(2) The increasing degree to which divergent viewpoints are:[33]

(1) Complex, such that science can contribute its sophisticated methods, rigor, and systematic long-term inquiries. Complex divergent viewpoints are typically about general natural and social system dynamics;
(2) Value-laden, meaning they are usually about normative policy issues based on their interests, policy objectives, or ethical values, as well as their roles in evaluating policy options, and so on;
(3) Disputed (publicly), which is also an indicator for the perceived importance of divergent viewpoints for policy-making processes.[34]

As a rough rule, the more complex, value-laden, and disputed the viewpoints are, the more appropriate it is to choose an approach that is further down the list of approaches presented in Table 1.

For example, the resolution-by-experts category of approaches is more adequate for cases that are not extensively disputed, nor overly value laden, whereas the delegation to policy approach is more likely to be appropriate for issues that are more value laden and disputed. The public deliberation category could also be adopted for relatively complex, value-laden, and disputed issues, while the heated conflict category seems to be the most appropriate in extremely heated and value-laden cases with significant complexity (and the highest uncertainty).

It is a challenge to identify these three characteristics in practice. While it is relatively easy to observe the extent to which a viewpoint is actually disputed in public policy debates, it is more difficult to discern the degree to which certain issues are complex in scientific terms. The most difficult task is to identify the level to which a divergent viewpoint is value-laden. However, there is an increasing body of literature that provides an analytical framework to identify the ethical value judgments embodied in scientific reports (e.g., for general discussion see Putnam, 2004; Douglas, 2009; for applications to IAMs see Schneider, 1997 and Ackerman et al., 2009; Dietz, 2013; and for the case of agro-economic models and water management see Biewald et al., 2014).

Let us briefly discuss a hypothetical, concrete example to illustrate what an application of the results of this chapter could look like. In one of the interviews, a GEO-5 author said

> *"Well I guess on the GMO issue I think, I think the biodiversity chapter's position was important because we couldn't say something completely different from what they said without acknowledging that, and I guess I don't know if that was the best way to resolve it, but I guess we resolve it by discussing in maybe a smaller core group…how we should treat what we said on that…. So I think it ended up sort of aiming for a kind of compromise and acknowledge authors' viewpoints and also make clear the link to, to what the biodiversity chapter talked about it."*

This means that a GEA writing team used the expert judgment approach to deal with the controversial issue of how genetically modified organisms (GMOs) are used in agriculture and what the related public policies should look like. This interview shows us that the expert judgment approach was applied successfully, or at least there was agreement between the GEA authors in the end. The authors may not have had a chance to choose another strategy due to the severe time restrictions in the GEO-5 process; however, other assessments such as the IAASTD, have struggled with the heated and complex topic of GMOs, which has plenty of policy implications. It is also worth noting that the IAASTD has been attacked for representing divergent viewpoints inadequately (Feldman and Biggs, 2010). So, given the interview statement above, how should future GEAs in similar situations respond to disputed and complex issues with direct policy implications?

A robust answer to this question requires a differentiated analysis of the divergent viewpoints at stake, as well as the GEA context (including, not least of all, the time resources available). If the divergent viewpoints regarding GMOs are mainly technical in nature (i.e., scientifically complex issues that are not highly value-laden and not overly disputed), then the knowledge approach might be adequate; otherwise, the expert judgment approach could work. Yet,

[33] According to the ideal conditions for the maximum appropriateness of each of the approaches.
[34] While these three characteristics are key, this is certainly no comprehensive list of characteristics to be taken into account when selecting the appropriate GEA strategy.

divergent viewpoints that seem to be harmless cases at the beginning can later turn out to have strong and highly disputed political and ethical implications. This transition in the character of divergent viewpoints can be due to either the negligence of the writing team or a change in the political context, which can lead to an increased politicization of the issue. In any case, it may be appropriate to consider a change in the approach of the GEA in order to avoid an escalation of the conflict.

It seems that, in the long run, a disputed, complex, and value-laden question, such as the GMO issue, cannot successfully be addressed using the resolution-by-experts or the-delegation-to-policy categories of approaches. Rather, it requires the public deliberation category and perhaps the map implications approach as well. Multiple policy objectives (food security, sustainable water management, economic growth, biodiversity, climate change adaptation and mitigation, social justice, health, etc.) and values are at stake with complex interdependencies and manifold trade-offs. Obviously, not all of the divergent viewpoints concerning GMOs could be made explicit and explored using the onerous map implications approach—but the most fundamental and disputed issues could be. Additionally, exploring the pros and cons of concrete policy options could help reveal the *real* divergent viewpoints (e.g., political interests instead of scientific uncertainties) that often underlie heated debates (Sarewitz, 2004).[35] Moreover, this approach is dependent on the will of governments and their commitments to such ambitious social learning exercises. However, both scientific experts and governments often seem unwilling to promote open and systematic learning about the political solution space. Both the theoretical literature, as well as the GEA expert interviews, revealed a couple of instances where powerful governments intervened in the GEA process, forcing scientists to delete certain politically undesirable viewpoints (e.g., Edenhofer and Minx, 2014). In order for the process to be successful, governments must take a stand during the inception phase of the GEA process on whether a policy assessment should allow for explicit divergent viewpoints or not. At the same time, the map implications approach is dependent on the researchers' willingness to explore a wide range of effects for alternative policy options. In particular, this presupposes inter- and trans-disciplinary cooperation. However, once again, the expert interviews partly revealed how difficult and challenging real interdisciplinary work is for many researchers.

5.5 Conclusion and recommendations

This chapter has identified nine strategic approaches for responding to divergent viewpoints in contemporary GEAs. Although none of these approaches is new, this empirically informed research provides the first systematic and relatively comprehensive overview of approaches to divergent viewpoints in contemporary GEAs (to our knowledge).

Based on the decreasing extent to which scientific experts in GEAs employing such approaches can provide clear guidance on policy-related divergent viewpoints, the approaches range from little or medium complexity (i.e., no conflict, resolution by experts, and delegation to policy categories of approaches) to the more complex, long-term, and extensive strategies included in the public deliberation category. We also explored approaches that, by definition, could not contribute much to the resolution of divergent viewpoints (i.e., the heated conflict category). All of the approaches have particular strengths and weaknesses and promise to be more or less successful under specific circumstances. The analysis also showed that many instances of existing divergent viewpoints in GEA processes have been routinely and successfully resolved using these approaches.

Future discussions about the design of GEAs may benefit from the overview and conceptual framework developed here. It might promote more systematic and explicit reflections on how to strategically design GEA processes in order to allow for a more rational open public discussions about policy-related divergent viewpoints. The three aspects identified above—i.e., complex, disputed, and value laden—may work better (as conceptual framework) than existing frameworks and terminology because they make it clear that there is a continuum between scientific and ethical-political divergent viewpoints. Moreover, this chapter provides a framework for how to systematically evaluate the application of these approaches; although, this remains a methodical challenge.

More research in this regard would be valuable; but this presupposes better access to empirical materials, including participatory observations. Essential questions for future deliberations on GEAs and divergent viewpoints based on the present research may include: how to improve the means, such as institutions and processes, to implement these

[35] Pre-studies could reduce the burden of GEAs in this regard (e.g., divergent viewpoints about environmental-political priorities could be explored before a GEA process begins; see Chapter 4).

approaches in GEAs; which viewpoints are, or should be, included or excluded in specific contexts, given a particular approach; how we can better understand and monitor the transitions (e.g., tipping points) of the characteristics and contexts of divergent viewpoints, which indicate whether or not there is a need for changing the GEA approach; how the risk of failure for particular approaches in specific GEA contexts can be better estimated, particularly in terms of legitimacy and if it is possible to create an early warning system. This chapter establishes the (so far lacking) necessary foundations for tackling these research questions.

Future GEAs should discuss possible strategies to respond to policy-related divergent viewpoints as early as the inception phase. The analysis above explains the criteria for how to select the appropriate strategies to respond to divergent viewpoints. A clear mandate is required if, for instance, the map implications approach is needed to coordinate the expectations of all the participating stakeholders.

When divergent viewpoints are present, GEAs can benefit from:
(1) Sufficient resources (i.e., time, funds, and expertise)
(2) Training to increase authors' leadership
(3) Intensive dialogue between scientists, policymakers, and the public,
(4) More transparency of divergent viewpoints and the way they are treated in GEAs
(5) Discussing and analyzing divergent viewpoints prior to the GEA process to reduce the analytic burden of GEAs, almost independently from which approach is chosen.

Most importantly, however, is making sure that the different approaches for responding to divergent viewpoints are discussed openly to begin with. The research presented here may encourage solution-oriented GEAs—despite the related risks and challenges—to address very complex, disputed, value-laden, and highly politicized divergent viewpoints more explicitly because promising coping strategies exist. Unfortunately, however, the expert judgment and avoid approaches seem to dominate GEAs in that regard according to the expert interviews. Employing other approaches in case might be more promising and help GEAs to become much more relevant for policy debates. GEAs would be better able to acknowledge that we live in a world with multiple objectives, interdependencies, and trade-offs (see the SDG debate).

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Chapter 6

Stakeholder engagement in GEAs

ABSTRACT

Global environmental assessments (GEAs) can be seen as some of the most concerted efforts to provide scientific policy-relevant advice to the international community. Engaging with a diverse range of stakeholders in these processes is central to the effectiveness of a GEA as it can enhance the credibility, salience, and legitimacy of the report by ensuring representation of different viewpoints, fostering deliberation, creating a sense of ownership, and facilitating information exchange between stakeholders. Determining who is a relevant stakeholder and by which modalities they can be best engaged in order to achieve specific objectives requires careful consideration of the potential implications of these choices. This chapter provides a conceptual framework for analyzing the objectives, means and implications of stakeholder engagement in GEAs, focusing on the trade-offs and co-effects involved when altering the modalities of different means. We apply this conceptual framework to analyze the modalities of two particular formats for engaging with stakeholders, which have been employed in some GEAs: regional stakeholder consultations during the GEA content development phase, and Summary for Policymakers negotiations during the final approval phase. The empirical cases are drawn from the Fifth Global Environment Outlook (GEO-5), the IPCC Working Group III contribution to the Fifth Assessment Report (IPCC WGIII AR5), and the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD). This chapter recommends that future GEAs create an independent, central coordinating body to oversee stakeholder engagement approaches; prioritize deliberation between different stakeholders; strengthen regulations on roles of stakeholders at summary negotiations, and; produce multiple summaries with input from the audience they target.

Key Messages

1. Global environmental assessments (GEAs) can be conceptualized as large-scale engagement exercises with diverse stakeholders, making this a central aspect of the strategy and design of a GEA.

2. A conceptual framework linking the objectives and means for stakeholder engagement in GEAs via the implications can help in both the ex-post evaluation and ex-ante design of different modalities of stakeholder engagement approaches.

3. Create an independent central coordinating body to oversee stakeholder engagement but with strong regional ties to maintain salience (contextual specificity) and legitimacy.

4. Expand opportunities for deliberation between stakeholders, with consideration of and planning for the potential for increased conflict and resource requirements, including both time and money.

5. Strengthen regulations governing the roles and responsibilities of different parties at Summary for Policy Makers negotiations, and make these clear to all before the meeting.

6. Produce multiple, audience-specific summaries as soon as possible after the underlying report is released. These should be developed as an integral part of the overall GEA process and planned from the very outset of the process, when the scope and objectives are first determined.

6.1 Introduction

Stakeholder engagement has long been a topic of interest in assessment making, and other activities at the science-policy interface, though primarily at sub-national and national scales (Reed, 2008). Recently, the topic has received increasing attention in assessments at the global scale (Carr and Norman, 2007; O'Faircheallaigh, 2010; Lingán et al., 2012), as stakeholders are regularly engaged to varying degrees and using various formats and modalities in the production and development of global environmental assessments (GEAs). This chapter seeks to develop a conceptual framework for contextualizing and analyzing different formats for stakeholder engagement in GEAs, and explores an application for the framework by empirically analyzing two specific formats of stakeholder engagement. The first format is that of the regional consultation, which is employed with different modalities in the cases of the Fifth Global Environment Outlook (GEO-5) and the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). The second format is the Summary for Policymaker negotiation among governments and GEA authors. These types of negotiations were held for GEO-5, Intergovernmental Panel on Climate Change Working Group Three's contribution to the Fifth Assessment Report (IPCC WGIII AR5), and IAASTD.

In general, there has been an increasing interest in stakeholder engagement at the global level aimed at influencing policy processes related to environmental issues in recent years. For example, the UN Stakeholder Forum Implementation Conference aimed at fostering a 'global civil society' at the Johannesburg World Summit on Sustainable Development in 2002 (Carr and Norman, 2007). The Copenhagen Consensus Centre was created in 2004 with the goal of engaging with diverse stakeholders to prioritize solutions to some of the world's largest problems while maximizing benefits to the most people possible (Bahgwati et al., 2004). More recently, broad participation was enabled through the use of an online 'e-inventory' in the ongoing process to establish a set of Sustainable Development Goals (Lingán et al., 2012; Cutter and Cornforth, 2013), and the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) has employed an innovative approach to stakeholder engagement at the global scale through a two-year consultation with diverse participants. This consultation determined the scope of and need for an assessment, which stakeholders can be considered as most relevant and how, more precisely, stakeholders should be selected and engaged with during the process (Thaman et al., 2013).

There has also been increasing recognition of the importance of stakeholder engagement in numerous UN fora in the past few years. Section C of the Annex in the Rio + 20 Outcome Document (UNGA, 2012) was explicit on the need to strengthen stakeholder engagement, as was the 126th Meeting of the Open-Ended Committee of Permanent Representatives (CPR) to UNEP when they called for increased engagement specifically in GEO-6. The CPR members stressed that reconsidering approaches to stakeholder engagement should occur before GEO-6 begins, providing a timely motivation for the current research (Appleton et al., 2014). Stakeholder engagement was once again an important topic at the first United Nations Environment Assembly (UNEA-1), the new governing body of UNEP. At UNEA-1 there were calls to engage more explicitly with communities of practice in GEO-6 and to increase the focus on encouraging dialogue and deliberation between the multiple stakeholders involved (UNEP, 2014).

Numerous challenges have been identified from the literature, which could pertain to stakeholder engagement in GEAs in many ways, including being considered as potential trade-offs when examining the implications. Resource requirements and challenges of coordinating large number of stakeholders into a global process are major deterrents for deeper and more inclusive engagement (Yosie and Herbst, 1998). The risk of overly politicizing scientific messages and losing scientific credibility are also high when engaging with too many non-scientific actors and allowing political and ideological viewpoints to influence messages. This can occur from allowing policy makers too much control over content and the interpretation of scientific findings, but, as other stakeholder groups have political interests as well, this risk can be seen as applying to stakeholders in a more general sense (McCright and Dunlap, 2011; Gauchat, 2012). Additionally, engaging with too many stakeholders may actually dampen or paralyze an assessment or decision-making processes when no common ground can be found (O'Faircheallaigh, 2010). Some argue that this is may be what occurred towards the end of the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) (Hilbeck, 2008; Edwards, 2012; Feldman and Biggs, 2012). Some scholars also point out that engaging with stakeholders can actually have unintended negative side effects, such as increasing the potential for conflict

or reinforcing power asymmetries between different groups (O'Faircheallaigh, 2010).

While much has been written on stakeholder engagement in national- and local-scale assessments (for example, see Hisschemöller et al., 2001; Webler and Tuler, 2006; Reed, 2008; O'Faircheallaigh, 2010; Salter et al., 2010), and the lead-up to the Millennium Ecosystem Assessment as well as the Harvard GEA Project covered some of the issues regarding stakeholder engagement in GEAs (Beck, 2004; Andonova, 2006; Berkes et al., 2006; Clark et al., 2006; Mitchell et al., 2006), research gaps remain. More specifically, while there is often agreement that stakeholder engagement in the context of GEAs is desirable and can lead to positive outcomes in terms of enhancing the overall effectiveness of GEAs, few empirical insights are available regarding if and how specific modalities to engage stakeholders within GEAs can attain various potential and actual objectives, and how challenges can be overcome. Andonova (2006) did demonstrate that the implementation of international air pollution standards is improved when stakeholders responsible for the national-scale implementation are involved. This is due to a strengthened understanding of the political solution space for stakeholders who have been engaged, and makes the topic of stakeholder engagement all the more important in light of the shift towards increasingly solution-oriented assessments as shown in Chapter 2 of this report. However, no comprehensive framework to systematically analyze and evaluate stakeholder engagement approaches in GEAs has been proposed thus far, and there are still many gaps regarding the evaluation of specific formats. This chapter attempts to address these research gaps.

In Section 6.2 a conceptual framework is proposed for analyzing the relationship between the objectives and means of stakeholder engagement in GEAs via their implications, and a review of potential objectives for engagement is provided. This section clarifies the terminology that will be employed throughout the chapter regarding what is meant by stakeholder, stakeholder engagement, formats and modalities for stakeholder engagement, and relevant stakeholders. Section 6.2 also describes the methods employed in the empirical analysis and the case studies examined. Section 6.3 provides the analysis of two general formats for stakeholder engagement in GEAs and their associated modalities, or the aspects that differentiate between formats employed in different assessments. In Section 6.4, the results of the analysis are discussed, and finally Section 6.5 summarizes the main findings and recommendations of this chapter, and briefly discusses additional promising formats for stakeholder engagement.

6.2 Analytic Framework and Methods

This section proposes a conceptual framework to analyze, evaluate and design stakeholder engagement approaches in GEAs, with specific attention paid to how these formats can serve to satisfy certain objectives. The motivation for this is that there is not currently a generally accepted definition of what constitutes 'successful' or 'unsuccessful' stakeholder engagement in GEAs, despite the fact that this is relevant for the practical design and conduct of the specific modalities of different formats. After outlining the framework, different potential objectives of stakeholder engagement in GEAs are discussed, which offer a yardstick for evaluating specific stakeholder participation modalities in GEAs. In addition, we introduce terminology to distinguish various stakeholder groups in GEAs.

6.2.1 Conceptual framework

The framework proposed here features a basic logical structure analogous to the broader OMC framework developed in Chapter 1, but relates more specifically to the process of stakeholder engagement within GEAs. The aim of this framework is to enable a logical evaluation of stakeholder engagement modalities used in past GEAs with respect to their ability to realize different objectives in terms of their practical implications, and thus to inform the design of future stakeholder engagement exercises. Figure 6.2.1 illustrates this conceptual framework as a feedback loop: When determining the objectives for stakeholder engagement at the outset of a GEA process, different means for achieving these objectives must be considered in terms of their anticipated ability to result in positive outcomes (or implications). The consideration of objectives, means and implications of stakeholder engagement could be accomplished in a stepwise manner, and the loop would continue when the initial objectives and means are revisited based on the acceptability of potential implications. Means for stakeholder engagement need to be selected so as to maximize expected achievement of the objectives as embodied by the implications. The means for stakeholder engagement refer to the general formats for engagement and the more specific modalities of

engagement approaches in different assessments, including organizational setup, the selection of stakeholders, and the use of resources.

When considering the interrelationships along this loop in the ex-ante design of a GEA, the objectives and means need to be aligned to ensure success, i.e. to maximize the probability that the means are adequate to actually achieve the normatively envisaged empirical implications (objectives). Such considerations might involve reducing the level of ambition of objectives for stakeholder engagement to match limited available means such as time or financial resources, or enhancing the means for achieving a given set of ambitious objectives for example by scaling up allocated financial resources or staff, or allowing for more time.

Using information from interviews, workshops and document analysis as detailed in Section 6.2.6 below, Section 6.4 of this chapter will employ process tracing for each of the two formats under consideration to determine the sequence of events, to assess which objectives specific to each GEA were envisaged, and to explore trade-offs between the employment of means and the attainment of general objectives as embodied in the implications. Clearly, such empirical analysis can only offer specific insights limited to the type of stakeholder engagement and the cases under consideration. However, together with and building on existing research offering insights on these interrelationships between objectives, means and implications reviewed in Section 6.3, an empirical research initiative exploring these interrelationships promises to enhance the efficacy of stakeholder engagement in future GEAs by providing better information on what has worked well and what has not.

6.2.2 Objectives for stakeholder engagement in GEAs

A major conclusion of the Harvard GEA Project was that there were three components to measuring effectiveness in GEAs, namely credibility, salience, and legitimacy (Clark et al., 2006). One more specific finding was that stakeholder engagement could enhance all three attributes (Andonova, 2006). Therefore, very broad objectives for engaging with stakeholders in GEAs could be to enhance the overall assessment's credibility, salience and legitimacy, and thereby improve its effectiveness. This follows the logic of Siebenhuener (2003) as well as the Harvard GEA project (Clark and Dickson, 1999; Cash et al., 2003, Clark et al., 2006), who found that a significant factor contributing to the overall effectiveness of GEAs are its design elements, including the approaches selected to engage with stakeholders.

The case of scientific credibility is relatively straightforward: in order to improve this attribute, a GEA should strive to engage with knowledgeable and trustworthy scientific experts who are highly regarded in the fields, which the assessment addresses. The case of salience, or the relevance of the GEA to target audiences and in particular to policy making, is somewhat more murky but still relatively well

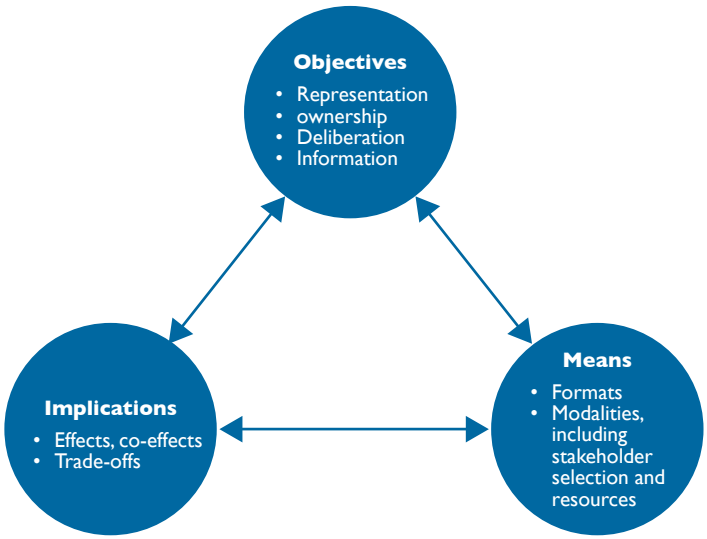

Figure 6.2.1. - *Conceptual framework for evaluating stakeholder engagement formats in GEAs. The objectives listed will be described in more depth in the following section (6.2.2).*

understood: engaging with target audience members and in particular policy makers during the scoping phase of a GEA can help to ensure the assessment will address questions which are relevant to their audience. Continuing to engage with these audiences throughout the GEA process can continue to ensure relevance, and give the assessment the highest chances of being usable, being effective, and having an impact or influence on its intended audience. Finally, legitimacy is probably the least well-understood attribute of an effective GEA. In the current research, legitimacy will be roughly defined as a perception by different stakeholder groups that their worldviews are represented throughout the assessment process, and that the process is perceived to be fair by these groups (Mitchell et al., 2006; Alrazi et al., 2010; Cashmore and Wejs, 2013).

The enhancement of these three major attributes can be seen as the over-arching objectives for engaging with stakeholders in GEAs. However, they are not easily measured and it is quite difficult to evaluate the appropriateness of different approaches to engagement by their ability to achieve such broad objectives. Therefore, for the purposes of evaluation and providing more workable recommendations, four second-order objectives, which contribute in some way to achieving the over-arching objectives of credibility, salience and legitimacy, with a particular focus on the latter, have been identified.

Engaging with stakeholders can improve the perception of *representation* within an assessment process. This relates to the fact that results of a GEA are intended to influence decision-making, in which the representation of different viewpoints and values is a major criterion in democratic societies (Lipset, 1959; Yosie and Herbst, 1998; Goodin, 2008; O'Faircheallaigh, 2010). In a global-scale process, as discussed in more detail below, every single person on the planet could in theory be considered a stakeholder. Therefore, a strong component of any attempt to engage with stakeholders during a GEA has to do with selecting the right representatives in order to convince a large variety of stakeholders that the assessment process and report are legitimate. One way of accomplishing this may be by engaging with communities of practice, a concept described by the work of Lave and Wenger (1991), and others (Wenger, 1999; Smith, 2003; Jasanoff, 2004a). What groups or communities are engaged with depends very much on the goals of the assessment and often on the target audiences, but could include for example engagement on ethical grounds based on democratic ideals, including a democratic right to participate in decisions which may affect one's life (Hourdequin et al., 2012) or engagement with the goal of altering accepted decision-making structures to empower marginalized groups or allow for more direct democratic action (O'Faircheallaigh, 2010).

Deliberation is often lauded at the science policy interface as a mechanism for cultivating mutual understanding between scientists, policy makers and other stakeholders (Wenger, 2000; Beierle, 2002; Bäckstrand, 2003; Chilvers, 2008; Stirling, 2008; Hourdequin et al., 2012). For example, this can help improve understanding of the types of questions for which communities of actors working on policy-relevant issues need answers, and also clarify the types of answers which science can or cannot provide. This in turn can ensure that expectations for GEA outcomes are realistic and also improve their focus on policy-relevant issues. Deliberation can furthermore enable learning, for example at the boundaries between the different communities of practice engaged in an assessment, which can in turn improve the trans-disciplinary nature of the overall assessment (Wenger, 2000).

Stakeholder engagement has been shown to increase *ownership* of the assessment on the part of participating stakeholders, and by this mechanism it is thought to increase the influence of the assessment (Clark et al., 2006; Mitchell et al., 2006). This concept of ownership is most often used to describe the buy-in by policy makers and governmental representatives, with the implication that it will increase the assessment's influence on decision making. A finding of the Harvard GEA Project, as shown in Mitchell et al. (2006), was that "the most effective path to influence [for a GEA] involves promoting substantive and substantial participation by potential users," (p. 333). This could apply to creating ownership by governments, but also from a range of other potential users or target audiences of a GEA. One aspect of ownership can be tied to co-production, where stakeholders who are involved in creating knowledge are more likely to buy into the products of this knowledge (Jasanoff, 2014). The concept of ownership is also related to increasing the trust that different stakeholders, and in particular the target audience, have in the assessment process and findings. This concept was also explored in the context of environmental decision-making by Beierle and Konisky (2000) and Beierle (2002), and many of their arguments appear to be transferable to GEAs. In particular, their arguments that increasing the engagement of different stakeholders does not

necessarily come at the cost of the scientific credibility of a particular decision, or an assessment, is critical.

Stakeholders can also provide a *source of information* unavailable in the peer-reviewed literature. This relates strongly to the attribute of salience. Many GEAs have inherited a tendency towards a strong reliance on peer-reviewed literature alone, and while this trend is decreasing overall, for example in GEO-5 and IAASTD and as shown in Chapter 2 of this report, there is still a pull towards peer-reviewed sources of information in order to maintain scientific credibility. Some research has found that peer-reviewed literature suffers from some kind of 'elitism' hampering its legitimacy, due to the fact that the majority of publications come out of developed countries, potentially biasing the data sources for GEAs from the outset (O'Faircheallaigh, 2010). The flow of information can go both ways; for example, policy makers can help determine the major questions an assessment should answer, provide information to contextualize sub-global scale policy analysis, and then receive information regarding potential policy options or future scenarios which are necessary to aid them in making decisions. In addition, various stakeholders including authors, producers, government representatives, civil society and others can engage in the co-production of knowledge, which could even be promoted as a guiding principle of stakeholder engagement in GEAs. This would of course involve determining 'what is', generating descriptive knowledge in collaboration with a host of stakeholders, but place much more emphasis on 'what ought to be', or the more normative implications of different options for the future and how to get there (Jasanoff, 2004a; Jasanoff, 2004b). This could be a highly valuable theory for GEAs to make use of, especially in light of the increasing focus on solution-orientation and policy options, and where the engagement of stakeholders representing diverse viewpoints could be most beneficial in order to gauge the desirability of different potential scenarios and normatively assess what ought to be (see Chapters 2 and 4).

These four second-order objectives are by no means comprehensive, and many GEAs detail much more specific objectives in their mandates or scoping documents regarding stakeholder engagement. However, these four objectives will serve to provide a framework for evaluation, and can also be conceptually connected to many of the more context-related GEA-specific objectives. While the four objectives identified above can be seen as coming primarily from the perspective of a GEA producer, there are of course a host of objectives and perspectives that could be pertinent to other stakeholders. For example, some producers may only seek to engage with stakeholders during an assessment because it is 'politically correct.' For some policy makers, one major objective of engaging with GEAs could be to exert some form of control over the process (Haas, 2004) and ensure that the results are not detrimental to national priorities. In this case, even if this objective is clear to scientists, they may still concede to participate in order to ensure that their research and work on the GEA results in some sort of impact on policy makers.

6.2.3 Who constitutes a stakeholder

Taking a literal definition, a stakeholder can be seen as any person holding a stake in the process or outcome of a GEA. Given that GEAs engage issues of global significance, if the stake in question is the right to a healthy and sustainable environment, then every individual in theory could be considered a stakeholder. While highlighting an important point from a democratic and normative policy-making perspective, this definition is of less practical use in the analysis and conduct of GEA processes. As with any large-scale policy processes, a certain degree of representation and accountability is required in order to render the deliberation in and organization of GEA processes practically feasible given transaction costs of communication.

It is useful to distinguish between *internal* and *external* stakeholders of a GEA; this is shown below in **Figure 6.2.2**. Internal stakeholders are those that are organizationally involved in the production of the Assessment Report in various ways. Among internal stakeholders it is useful to further distinguish between *continuously involved* stakeholders, i.e. individuals who directly contribute to written content (authors), the organization of drafting the final report (producers), and the specification of GEA objectives (for example, government representatives); and *intermittently involved* stakeholders that contribute in various other ways to the production of the report (for example, as reviewers, in consultation activities, in oversight committees). Within the group of external stakeholders, *intended target audiences* are particularly relevant as these groups are consciously addressed during the setup, writing and communication of a GEA, thereby guiding its orientation. Intended target audiences might not always overlap with the actual *users* of a GEA, i.e. those who actually consume their various outputs – some members of intended target audiences may not be

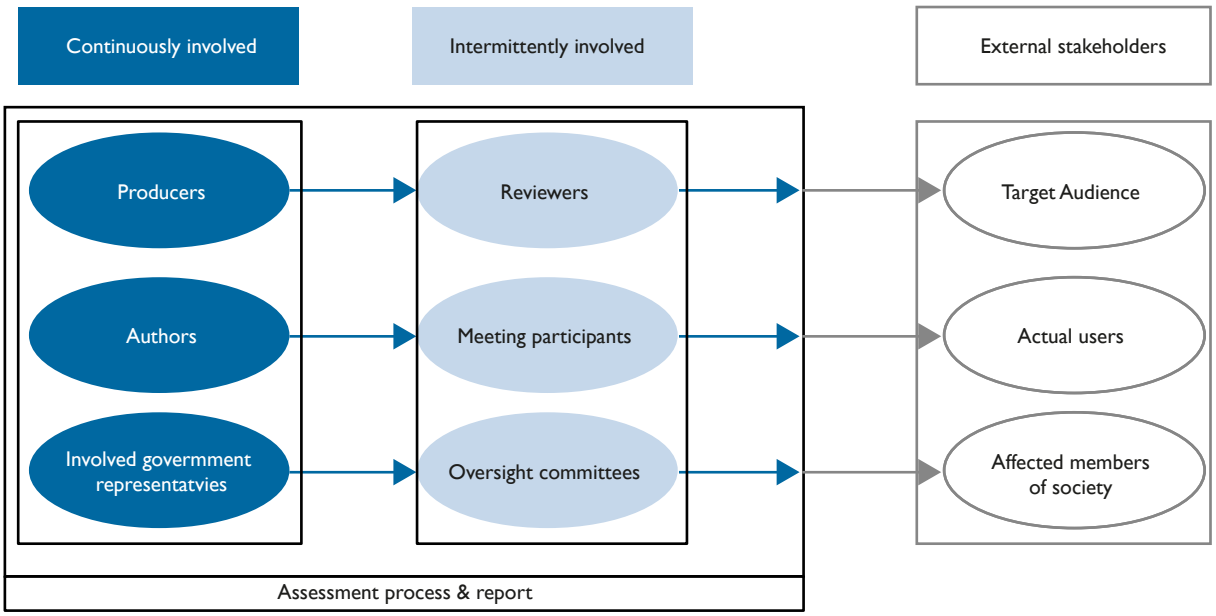

Figure 6.2.2 - *This figure shows the different types of stakeholders in an assessment. Authors, producers and some heavily involved government representatives are indicated in blue; and are the closest to the assessment at all stages (i.e. continuously involved). The intermittently involved stakeholders can include, for example, reviewers, participants of meetings within a GEA process, or members of an oversight committee. In grey, the external stakeholders are much broader and can include the intended target audience, the actual users of the GEA, as well as all members of society affected by the implications of a GEA.*

actually reached, while conversely other stakeholders might become users who were not targeted. Finally, the members of society at large who are or potentially could be affected by the trends described or policy solutions or options recommended in a GEA could also be considered external stakeholders, even though they neither participate, use the report, or are part of the intended target audience.

This final group could potentially include some of the most vulnerable people in the world to the impacts of global environmental changes, many of whom are often marginalized in global environmental governance regimes. Some efforts have been made to include these voices in GEAs and to reposition at least some of them from 'external' to 'internal' stakeholders, for example the significant effort in the Millennium Ecosystem Assessment to include traditional knowledge, including a week-long meeting called "Bridging Scales and Epistemologies" discussing precisely this held in 2004 that yielded an edited volume (Berkes et al., 2006), and the collaboration between GEO-5 and the networking organization called ICLEI - Local Governments for Sustainability to produce a summary for Local Governments (Simpson et al., 2012). However, much remains to be done in order to more fully integrate affected members of society, including in some cases a basic recognition that such stakeholders can be important to a GEA.

Obviously, one key strategic question in the design of a GEA is where to draw the lines between these groups (and how to specify the mandates for and modalities of engaging with internal stakeholders), in particular between internal and external stakeholders: If GEAs are regarded as opportunities to impact public policy processes, the question of who is being internally represented in these efforts and who is not is clearly a politicized one (Jasanoff, 2004b). But even the specification of target audiences has relevant implications, as the images of these target audiences held by writing teams will to a significant extent guide the writing process. In addition, the specification of the various internal stakeholder groups (and the specification of the roles of individuals) as well as the selection of individuals from different groups and who bring different perspectives into these functions bears important implications for the development of a GEA.

6.2.4 Formats and modalities for stakeholder engagement

There are multiple general formats for stakeholder engagement employed in GEAs, each of which features different modalities depending on the assessment context and many other factors such as time and money. Formats include, for example, the scoping for the assessment report, consultations with stakeholders at regional levels during content development, the

review process, and summary for policy makers (SPM) negotiations. Modalities refer to the specific attributes of these formats, which is what differentiates the format employed in one GEA from the same format conducted in a different manner and under different circumstances in another assessment. For example, while a regional consultation may be considered a format for engagement using this terminology, the modalities may change from assessment to assessment. These modalities could include the types of stakeholders involved in the meeting, the duration and number of consultations held during the course of the assessment, and the types of questions the consultation seeks to answer. Thus, while the format determines what is within reason to compare for the purposes of this chapter, it is in fact the modalities associated with specific formats as employed in different GEA contexts that will be analyzed.

For the purposes of this analysis, two formats will be examined. Consultations at the regional level as well as the SPM negotiations will be analyzed in greater depth since these represent two major phases in an intergovernmental assessment, and due to the requirement to limit the cases considered and to align the limited resources, in particular time, with the objectives of this study. Additional empirical case studies conducted in a longer-term study could further enhance knowledge on the interrelations between objectives, means and implications of stakeholder engagement formats.

6.2.5. A step further: Describing who constitutes a 'relevant' stakeholder

Given the definition of 'stakeholder' put forth in Section 6.2.3, GEAs simply to do not have sufficient resources to engage with everyone. This raises the question of which stakeholders are most relevant. The term *relevant* is often used in describing which stakeholders will be engaged with during an assessment process (SCCPAST, 2003; UNEP, 2010a) but the more precise meaning of who is most 'relevant,' including an explicit description of which objectives and stakes are at play, is not elucidated in such GEA background documents.

When determining what constitutes a relevant stakeholder, the concept of a 'relevant stake' becomes important. While it is beyond the scope of the current research to analyze all of the potential stakes in

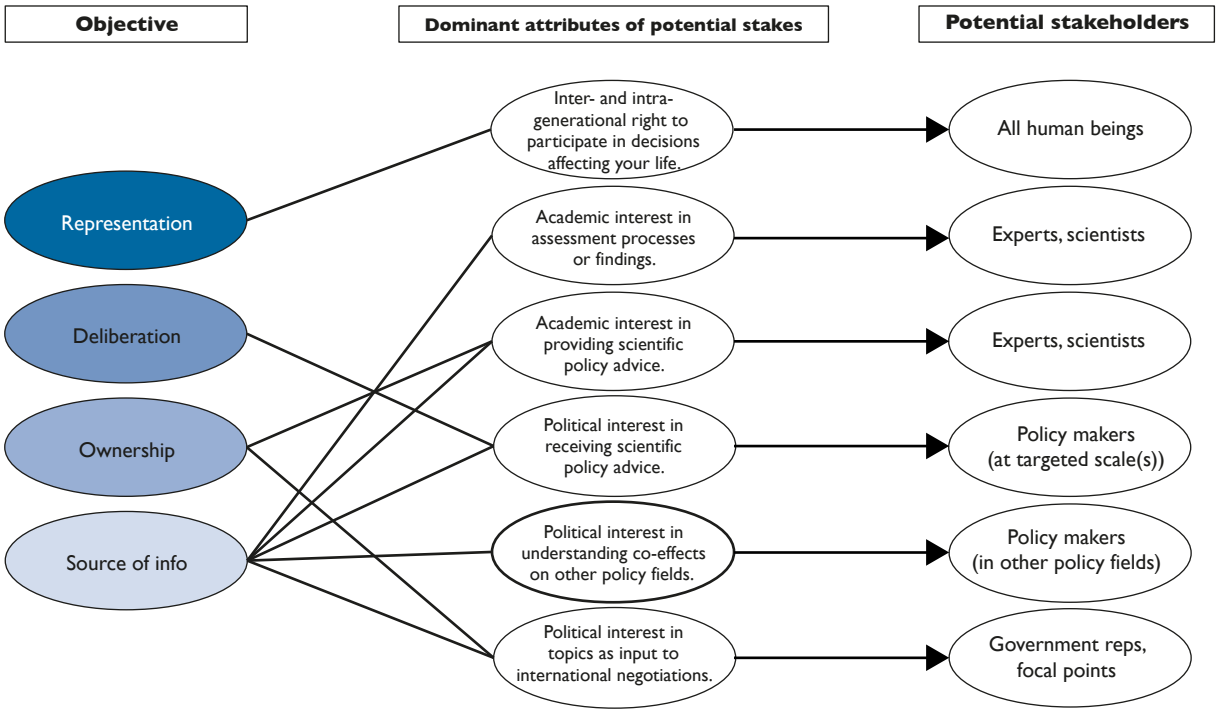

Figure 6.2.3. - *This figure shows the relationship between the four second order objectives for stakeholder engagement in GEAs as identified in Section 6.2.2, different dominant attributes of potential stakes, and the appropriate selection of relevant stakeholders which these lead to. This figure is intended to show the logical steps from objectives, to the dominant attributes of potential stakes which these objectives may imply, and finally to the selection of relevant stakeholders. The list of dominant attributes of potential stakes, and the corresponding list of potential stakeholders, are by no means meant to be comprehensive but are rather intended to serve as an illustration to aid in the logical and transparent selection of relevant stakeholders in future GEA design.*

depth, an example is presented to show how relevant stakeholders could be determined. For example, if the objective of the engagement is to increase the ownership amongst policy makers, then the 'stake' could refer to who has a political stake in the decisions or outcomes related to a given environmental issue. Another example stems from the engagement of authors and experts in the assessment process, one of the major objectives of which is often to provide a source of information for the GEA. Depending on the objectives of both engaging with authors and experts as stakeholders as well as of the overall assessment, the types of expertise deemed as relevant can be different. For instance, in early assessments engaging with stakeholders was much more limited and the relevant stakeholders engaged as authors were much more likely to be from natural scientific domains than from the social sciences. However, as the objectives of the overall assessment have shifted, for example moving towards increasingly solution-oriented GEAs, and as more differentiated types of information are required, for example moving away from a focus on observational and natural sciences towards a broader base including social sciences and humanities, the types of experts that need to be engaged as authors has changed.

These shifts, as shown in Chapter 2, have resulted in a change in stakeholders even beyond the 'continually involved' group shown in Figure 6.2. For instance, an increased focus on having an influence on policy through salient, solution-oriented GEAs has required prioritizing legitimacy as well, and involving a broader constituency of stakeholders in order to ensure the results are indeed applicable and acceptable to policy makers. Of course, the context of an assessment, including its envisaged impacts and target audience, also play a significant role in determining which stakeholders can be considered as most relevant, and along with the objectives of engagement can help to co-determine the selection of stakeholders. It also seems promising to select relevant stakeholders by strategically engaging with communities of practice that could satisfy the objective of providing the information necessary to cover the intended scope of the GEA, and satisfy the objective of representation by ensuring that different viewpoints and values are indeed being heard and taken into account. Based on the examples highlighted above, it is reasonable to assume that one particular 'stake' of highest relevance cannot be conclusively defined since the stakes will change depending on the context and scope of the assessment, the objectives of both the assessment and more specifically of engaging with stakeholders, as well as the type of envisaged impact of the assessment. Clearly outlining the objectives of stakeholder engagement could certainly help in determining the relevant stakeholders, since these concepts are quite closely related.

Assessment producers, in determining who is a relevant stakeholder, often employ the concept of relevant stakes implicitly. Oftentimes the most relevant stakes may be determined based on the personal objectives for the GEA in general and for stakeholder engagement more precisely of those making the decision. In these cases, there may well be overlap with the over-arching or the second-order objectives for stakeholder engagement, but this is certainly not guaranteed. Regardless, making the decision of who constitutes a relevant stakeholder explicit is crucial to increasing transparency and creating a better understanding of how different stakeholders may help achieve the objectives of stakeholder engagement approaches in GEAs. Being transparent in this decision will also help to limit criticism of this crucial step since those making decisions in the context of a GEA regarding who should be involved will be able to show how they arrived at this decision based on a logical flow from objectives and assessment context to the determination of relevant stakes and stakeholders. Figure 6.2.3 shows how different objectives identified in Section 6.2.2 are related to the dominant attributes of potential stakes which have been drawn from the literature. It is important to note that the list of dominant attributes and the potential stakes to which they refer are by no means intended to be comprehensive or mutually exclusive; rather, the figure is intended to show the logical train of thought that leads from an understanding of important objectives, to the concept of which stakes are most relevant, to the selection of the most relevant stakeholders for engagement in a GEA. This review is not undertaken in order to be prescriptive about who should be considered as a stakeholder, but is meant to encourage a more systematic, logical and transparent mechanism for arriving at who is selected as a relevant stakeholder in a GEA.

6.2.6. Methods: Cases and sources of data

The Fifth Global Environment Outlook (GEO-5) is the primary case study, with comparisons drawn to the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) and Working Group 3 of the IPCC's Fifth Assessment Report (IPCC WGIII AR5). GEO-5 was chosen as a

case study because it is the flagship assessment series of the UN Environment Programme (UNEP), because it is the most comprehensive assessment of global environmental change with regards to scope currently available, and due to its emphasis on stakeholder engagement. It will be the focus of this research, since considerably fewer academic articles have focused specifically on this important GEA as compared to other cases.

IPCC WGIII AR5 was selected as comparison to measure the relative success of GEO-5 because it is one of the most well-known GEAs conducted under a similar intergovernmental governance scheme as GEO, in addition to being one of the most cited and discussed. Working Group III in particular was selected due to its attempts to deal with ethical issues and potential solution spaces, which are likely to require input from diverse stakeholders to be able to deal with more so than a purely problem-oriented assessment. In addition, IPCC is a recurring assessment, and has acted as an unofficial model for many other assessments that followed in terms of procedures (UNEP, 2014).

Finally, the IAASTD was selected because it is a good representative of an assessment process governed not by an intergovernmental panel but rather by a collection of international organizations including the World Bank, the Food and Agriculture Organization, UNEP, UNDP, and others. However, it has also been hailed as one of the largest-scale attempts to engage with a huge diversity of stakeholders ever attempted, and was even considered as a type of "social experiment" by its Chairperson Robert Watson (Watson, 2009). Thus, for the purposes of investigating stakeholder engagement into these GEA processes, IAASTD is considered as an important point of reference from which to derive lessons for future GEAs regarding who and how to engage with as stakeholders.

Gaining empirical access to past stakeholder engagement exercises in GEAs is challenging (see also the Introduction and Annexes to this report), in particular to be able to establish solid *ex post* relationships between the initial objectives, envisaged and actual modalities, and actual implications of these exercises. The empirical analysis in Section 4 tackles this challenge by being based on extensive interviews with authors, producers, experts and policy makers involved in one or more of the three GEAs considered (see below). In addition, 6 interviews were conducted with target audiences for the assessments who were not involved in any of the GEAs in question. Since the project at hand has a strong emphasis on GEO, most of the interviews (88% of a total of 83 interviews conducted to date) focused on this assessment. This includes at least 20 interviews with participants of regional consultations held during the content development of GEO-5, and 13 participants of the GEO-5 SPM meeting. The information regarding the number of interviews conducted with participants of these two meetings is as present incomplete, due to incomplete participant lists and some missing information from interviewees. Two workshops have also been conducted with UNEP staff in August 2013 and with high-level authors from GEO-5 in October 2013. Further details on the treatment of materials collected during interviews and workshops, as well as the methods employed can be found in the Introduction chapter, and in Annexes B, C, D and F.

For both the IAASTD SDM and the IPCC WGIII AR5 SPM, the primary sources were opinion pieces on experiences by individuals during the negotiations. However, additional information to back up claims was found during a small number of interviews conducted primarily to confirm facts and opinions (2 interviews each on IAASTD and IPCC WGIII AR5, with additional interviews planned in the near future). In addition, official assessment documents such as the assessment mandate, scoping documents and meeting reports, peer-reviewed literature as well as opinion pieces were analyzed for all three assessments in question. This was especially crucial in order to draw conclusions based on experiences with IAASTD and IPCC WGIII AR5, since considerably fewer interviews were conducted specifically on these assessments.

6.3 Case Study Evaluation

This section analyzes two examples of stakeholder engagement formats in GEAs: regional stakeholder consultations and the negotiation of the Summary for Policy Makers (SPM) document. The objectives sub-section for each format will discuss both the GEA-specific objectives, as described in official assessment documents such as the mandate, the scoping document and the background documents for the meetings in question, as well as their connection to the second-order objectives described in Section 6.2.2.

6.3.1 Regional consultations with stakeholders

In both GEO-5 and the IAASTD, regional consultations took place at a regional scale. Since there is no parallel

for these consultations in the case of IPCC WGIII AR5, and since examining a third GEA process in depth was beyond the scope of this research, only the former two examples will be discussed in this sub-section.

The analysis of the GEO-5 regional consultations is based on extensive semi-structured interviews with 22 participants, plus six additional participants who attended one of the two workshops but were unavailable for follow-up interviews. The interview and workshop material collected included information on all of the six regional consultations conducted during GEO-5. In the case of the IAASTD, only 2 interviews have been conducted to date, albeit with high-level producers with in-depth knowledge of the objectives, process and the outcomes. As this is a statistically insignificant number, the insights presented below on the IAASTD will stem primarily opinion pieces and peer-reviewed literature.

80% of interviewees believed strongly that the regional consultations were an important format for engaging with stakeholders in the GEO-5 assessment, but in some regions there seemed to be specific modalities which could be changed in order to improve the outcomes of the consultations. This overall support for the consultations is indicative of the fact that the format should not be excluded from future GEAs, but does not discount the fact that modifications could be made to specific modalities in order to improve the achievement of its objectives. The more specific positive and negative aspects of the two cases of regional consultations examined will be discussed in depth in Section 6.3.1.3.

6.3.1.1 Objectives

In GEO-5, regional consultations for each of the six UNEP regions (Africa, Europe, West Asia, Latin America and the Caribbean, and North America) were held with a range of stakeholders. The specific objectives of these meetings, found in the scoping document and the background note for the regional consultations (UNEP, 2010a; UNEP, 2010b), were for stakeholders and the UNEP Secretariat to agree on priority environmental issues and challenges within each region and select internationally agreed goals to address them. This was finalized with input from a much wider-ranging survey, which, while interesting from many points of view, will not be examined in depth in the current chapter due to time constraints. During the regional consultations, participants were also tasked with discussing and identifying gaps in current policy to make progress towards these priority issues as well as on promising policies to address them. The specific objectives of the GEO-5 regional consultations are intimately connected with three of the four second-order objectives listed in Section 2.2. Firstly, improving the representation of different stakeholders in determining the priority issues by region is clearly emphasized, which was reflected relatively strongly in the content of Part II of the final GEO-5 report. The specific objectives from the scoping document and background note also reflect the objective of acquiring information for the report, in this case with regards to priority issues, related goals, policy gaps and potential policies that could fill these gaps. Thirdly, the consultations provided a space for face-to-face deliberation, which a simple survey format would not have achieved.

In IAASTD, the consultations also sought to prioritize environmental issues at the regional level. Additionally, these consultations aimed to foster discussion on the expectations for the assessment, the types of output which might be considered useful, and the scope of the assessment including detailed chapter outlines. By opening with the question of whether such an assessment was even necessary, the IAASTD consultations invited input from a very broad group of stakeholders into the scope of the assessment, including its fundamental purpose and its design (see, for example, Kapila, 2003; Sithole et al., 2003; other regional consultation meeting reports available at IAASTD 2009). The parallel to this structure in the GEO-5 process would be the First Intergovernmental and Multi-stakeholder Meeting, conducted at the very outset of the GEO process, which also allows stakeholder input into decisions regarding the assessment process but which is conducted separately from the regional consultations.

The IAASTD consultations also reflected three of the four over-arching objectives explained in Section 6.3.2 in a similar way as GEO-5. Representation was more explicitly emphasized in the specific objectives for the IAASTD regional consultations, which is evidenced by a strong focus on including representatives of many groups including "specialists and generalists, natural scientists and policy experts, experts in local and institutional knowledge, producers, environmentalists and health experts from all relevant stakeholder groups active in the area of agriculture (governments, private sector, producers, consumers, non-governmental organizations, international organizations, extension systems, foundations, scientific organizations and individual scientists)" (SCCPAST, 2003). As with GEO-

5, increasing the ownership of the report by different stakeholders was not an explicit objective.

6.3.1.2 Means

The GEO-5 consultations lasted two days per region, and involved on approximately 30 participants in each region. Organization of the consultations took place at the UNEP Regional Offices, including the selection and invitation of participants. In IAASTD, there were two consultations of two days each in each of the five world regions with an average of 60 participants in each meeting. The consultations in IAASTD were organized through the Multi-stakeholder Bureau (IAASTD, 2009). The IAASTD regional consultations seem to have had more resources earmarked for consultations, and decided to conduct these meetings at the very outset of the assessment rather than in the middle of content development, accounting for some of the differences such as slightly different objectives and the different numbers of consultations and of participants. Table 6.3.1 summarizes the objectives and gives a general overview of the formats in order to facilitate reading of the evaluation below.

6.3.1.3 Implications

Many diverse viewpoints were expressed by interviewees regarding the consultations in GEO-5. In some regions, for example in Latin America and the Caribbean (LAC), there was a high degree of satisfaction with the consultations. This was generally due to successful discussions regarding priority issues for the region, as well as good communication between organizers and participants. In the LAC case, some participants reported a very positive experience with the regional consultation due to a feeling that a representative group of participants had been chosen who were able to reflect different perspectives regarding environmental issues, and in particular the regional priority issues, than what science alone could accomplish. One participant from the LAC regional consultations reported that "*I think we had a good mix with the government and non-governmental responses so yeah I would say my regional was satisfying*," and another participant stated that the reason to include stakeholders in a meeting like the regional consultation, and one of the reasons for success in LAC, is "*because the perspectives of the problems that the stakeholders have are completely different from that scientists point of view.*" This is consistent with the second-order objectives of improving representation and providing a source of information via stakeholder engagement, and show that regional consultations as conducted in GEO-5 do have the potential to achieve these two objectives.

Despite this success concerning the representation of stakeholders in the LAC consultation, other regions did not fare as well in this regard. In particular, many participants from consultations held in North America and, to a lesser extent, in Europe and Asia and the Pacific (AP), felt that there was a lack of balanced representation at the meetings they attended (n=14). Given the importance of representation to the over-arching objective of legitimacy, the fact that 70% of regional consultation participants felt that there was a lack of balanced representation at the meetings they attended could be indicative that there were

Table 6.3.1: *Summary of objectives and brief description of formats employed in regional stakeholder consultations. NOTE - still in development, plans to add more information (ie. scale of assessment - page count, time scale, etc.) to further contextualize the data on the regional consultations.*

Assessment[1]	Summary of objectives	Number and types of parties or participants	Length	Additional information
GEO-5	Determine regional priority issues, related internationally agreed goals, and potential policies to address the issues.	Approximately 30 participants at each of five meetings	2-3 days per region in each of five regions (11 days total)	General guidelines provided by UNEP, chairs voted at outset of meeting by stake-holder groups, meetings took place close to the mid-point of the assessment.
IAASTD	Determine need and expectations for assessment, regional priority issues, and potential solutions.	Approximately 60 participants at each of ten meetings	2 x 2 days per region in each of 5 regions (20 days total)	Few institutional guidelines provided, chairs voted at outset of meeting by stake-holder group, meetings took place early on in assessment process.

[1] IPCC WGIII AR5 is not included in this table since no format analogous to the regional consultations in GEO-5 and IAASTD was employed during the course of this assessment.

questions about the legitimacy of the exercise overall. Since increasing legitimacy was a major reason for conducting the regional consultations in the first place, the fact that some consultations may have 'de-legitimized' the process in the eyes of stakeholders can be seen as highly counterproductive. In most cases, this criticism of the consultations was due to a feeling that more participants with knowledge about policy processes should have been included (n=6), and in fact 50% of interviewees who had attended the regional consultations would have liked to have seen an increased focus on potential policy solutions in the regions at the meetings. While this was an initial goal of the regional consultations, at least two participants chalked the insufficient focus on potential policy solutions to a lack of time: "*if we had then moved to discussions of solutions and we needed to be in a perhaps week longer event.*" The other participant suggested having further consultations in order to tackle this issue in more depth: "*Perhaps organizing a couple more of […] extra consultations […] to make a better analysis of some of the case that we put forward to illustrate policy and I think more then on the production of tailor-made policy briefs at the end.*" However, it is important to note that such a shift in the emphasis at the regional consultations would also require a more strongly developed policy appraisal methodology, as discussed in Chapter 4 of this report.

There was general satisfaction with the deliberation at the regional consultation in the Asia and the Pacific (AP) region. While one interviewee explicitly mentioned that they felt there was strong deliberation at the meeting, the five other interviewees who attended the consultation in the AP region agreed that deliberation was strong when prompted. Of the interviewees from the AP region who had attended the GEO-5 regional consultation, all but one (n=4) noted that they would advocate for additional regional-scale consultations during the process in order to engage stakeholders in more activities related to policy analysis, such as determining successful policies with different groups of stakeholders in order to have a more representative discussion of policy options from different perspectives.

One author raised the issue that while fostering a sense of ownership and buy-in to the assessment may be likely for the individuals participating directly, it is much less certain that this buy-in will extend to the entire community these individuals are representing. Using the Sustainable Development Goals (SDG) process as an example, this interviewee said that global-scale processes:

> *"sometimes can get bogged down a little bit and try to be too politically correct in making sure that all stakeholders have a voice throughout the process does that really lead to better buy-in from all of those groups you know the fact that the you know the private sector will have had one representative representing the private sector does that really mean that the private sector will get behind the SDGs because of that, I somehow doubt that."*

This calls into question the ability of assessments to truly achieve ownership or buy-in through stakeholder engagement at all, and also raises questions about the purpose of representation. While this author was the only one to raise such issues, they remain important to consider nonetheless, and at the very least should indicate the importance of selecting the 'right' stakeholders to participate in order to maximize the positive outcomes of stakeholder engagement.

25% of authors pointed out an issue with confusion over the precise, GEO-specific objectives of the consultations. For example, in the North American consultations, which were held in two parts, one part listed priority issues for which they believed there were positive lessons to be learned from successful policies to mitigate problems while the other part listed the most urgent and complex issues that often didn't have associated solutions. In other words, one half of the consultation picked priorities based on the presence of some successful solutions that other regions could potentially learn from while at the other half, participants were reluctant to focus on environmental issues that were relatively well managed, and rather were more interested in selecting more urgent and complex environmental issues, which in most cases meant that there wasn't a legacy of success cases to draw from. As one participant noted:

> *"we weren't even sure if we were voting on the biggest problems or the biggest solutions, it felt like we were the only ones that voted on solutions, everyone else voted on problems."*

This confusion over objectives resulted in great difficulty in bringing together the results of the consultations into one coherent and representative set of priorities for the North America chapter, strongly

hampering the ability of the consultations to satisfy the general objective of providing information for the report. This indicates that coordination between consultations in order to achieve at least somewhat comparable results was a major challenge, a point which was echoed by 5 interviewees who attended regional consultations which took place during the content development of GEO-5, though nearly all these critiques stemmed from the North American region which was particularly problematic in this regard. All were quick to point out, however, that this did not imply that all consultations should be conducted in the same way since regional differences and context was absolutely crucial to account for.

35% of participants felt that the system of choosing priority issues from a pre-determined list was too similar to voting in some regions, primarily in North America but also to a lesser extent in Asia and the Pacific and Europe, which could have been accomplished through a survey without the added cost of a live meeting. One participant stated that "*of course we try to get the the critical issues for the regional consulting meeting as I remember but, but this is still like the top to bottom, top-down, top-down*." This was again primarily the result of poor communication, since in fact the issues lists for each region were the outcome of previous regional-level meetings, and had also been informed by a broad GEO-5 Questionnaire distributed to many stakeholders (approximately 220) in July and August 2010 (UNEP, 2010b). Additionally, according to UNEP, the list was not intended to be a limiting factor in determining the final issues but rather serve as guidance although none of the interviewees who had participated in regional consultations seemed to be aware of this based on the fact that none shared this information during the interviews.

In the case of the IAASTD, the major objectives for engaging with such a broad diversity of stakeholders can be interpreted as improving representation and providing a source of information for the report. According to the interviews, the main objectives of stakeholder engagement and in particular of the regional consultations were to give the assessment legitimacy by ensuring that as many perspectives as possible were included in the assessment, again driving home the intimate connection between legitimacy and representation. The more specific objectives of the regional consultations included figuring out priority topics for the report to cover in depth, in essence helping producers and authors navigate the complex over-arching topic of agriculture to determine specific issues on which to focus. While this is relatively similar to GEO-5, there seem to have been fewer official guidelines directing the choice of priorities (Kapila, 2003; SCCPAST, 2003; Sithole et al., 2003; IAASTD, 2005); despite this, there were comments which indicated that producers could have been somewhat more open-minded when entering into the regional consultations, especially concerning the overall direction of the assessment. While producers did not force their views on other participants, some still entered into the meetings with pre-determined ideas on the potential scope of the assessment, and may have inadvertently influenced the outcomes of such meetings. Additionally, since the consultations took place earlier in the assessment process than in the case of GEO-5, it may be that the choice of priorities from the meetings was able to provide stronger guidance to the scope of the overall report rather than the scope of the chapters focusing on regional-scale issues alone. In terms of objectives, this could be seen as the equivalent of the GEO-5 First Intergovernmental and Multi-Stakeholder Consultation, which was held in March 2010, and which finalized the scope of the assessment with significant input from stakeholders.

A major trade-off in having the consultations early in the process was that more specific, content-related issues, and divergent viewpoints regarding these issues, could not be discussed in great depth. On the topic of IAASTD, one interviewee felt that additional consultations later in the process would have been helpful in order to ensure continuing legitimacy and that authors and producers had not gone off in the wrong direction, or a direction counter to what input from a broader group of stakeholders might have indicated. In other words, consultations held towards the mid-point of the content development of the assessment could be beneficial in that they can ensure continued representation of multiple perspectives, an additional chance for fostering deliberation and ownership during the content development process, and a potential source of information at a stage where some of the gaps in information may be better identified, making stakeholder selection more focused. This insight may indicate that consultations held exclusively at the earlier stage of the assessment are insufficient by themselves.

The work of the coordinating body, which was called the Multi Stakeholder Bureau or the Bureau for short, helped to ensure a representative and highly diverse group of stakeholders were convened at regional consultations, resulting in an overall perception that,

at least in this respect, a broad representation of viewpoints was achieved (IAASTD, 2009; Keith, 2008). One interviewee explained that the nomination process was completely transparent, with the Bureau selecting representatives from a broad diversity of categories such as international and local NGOs, business and industry, and national governments based on nominations received from the organizations or governments themselves. However, the increased conflict which arose over the course of the IAASTD process was possibly due to the higher diversity of participants and perspectives. This conflict, which began slowly during the regional consultations, implies a significant trade-off between more diverse representation and increased potential for conflict which requires consideration (Scoones, 2009; Feldman and Biggs, 2012). One interviewee explained that the conflict which began at the regional level became even more intensified at the global scale. Overcoming this trade-off would require additional attention to methods of dealing with divergent viewpoints as well as additional transparent preparation for unavoidable conflicts, as described in Chapter 5 of this report.

One potential reason for the challenges with GEO-5 as highlighted earlier in this section could be a lack of accountability in terms of organization and insufficient central coordination of the regional consultations, which were overseen primarily by regional offices. This is true in particular with regard to achieving the objective of representing different viewpoints within a GEA, and the confusion over objectives and other difficulties in communicating with consultation participants, and the identification of the potential reason is made through comparison with IAASTD experience as detailed in the two preceding paragraphs. While it is understandable that the consultations could not be identical from one region to another as regional contexts vary, a point echoed by numerous participants interviewed, having an independent, centrally-coordinated body to organize stakeholder engagement approaches could help to ensure that a representative sample of participants are convened at the different meetings, and that the processes will yield comparable results from different regions. Additionally, the body could help to improve the communication of objectives to participants. While there are potential negative trade-offs involved in moving towards more centralized planning, for example increasing the impression of top-down policy advice as opposed to co-produced policy options, in order for the regional assessment outcomes to be amalgamated into a global assessment, there needs to be some degree of coordination between the regions, and a balance must be sought between coordination and context-relevance. This could help provide information for the global level that is comparable, but could also allow a higher degree of consistency regarding the selection of stakeholders in different regions, for example by engaging in explicit discussions of what groups of stakeholders should be represented at the meetings based on the objectives of the consultations as well as the relevant stakes deemed of highest importance as described in Section 6.2.5.

A major trade-off in employing the regional consultations as a source of information for the report seems to be the time and effort required to do so in conjunction with a deliberative meeting, as opposed to, say, a survey or a voting-type mechanism. One interviewee stated that in IAASTD, meetings where deliberation was prioritized through breakout groups, such as the First Global Consultative Meeting in Dublin in November 2002, resulted in much better outcomes than meetings where deliberation wasn't as strongly emphasized, as was the case in some of the regional consultations. It may be that, in order to maximize resource-efficiency and minimize the effects of this trade-off, it could be a better option to acquire information required for the assessment and encourage deliberation in a process external to the assessment itself. This could be through an ongoing research project, for example, which could then even potentially be peer-reviewed, overcoming some of the issues with including 'grey literature' in a GEA. This could also be more effective, since a research project or research projects of this type could potentially go on for a longer period of time, beyond the scope of a single assessment though it could certainly feed into GEAs over time, allowing much more in-depth input on the part of stakeholders. This would lead to the improved representation of different viewpoints, but could also allow a better source of more interesting and normative information if more time is allotted to co-producing it, and could encourage deliberation more effectively than the short-term regional consultation formats seem to have done. Importantly, such research need not be facilitated by the bodies producing the GEAs, but may be self-organized by communities of practice and financed e.g., by national or regional science funding agencies, and may be considered as a 'rolling project' for UNEP.

Not engaging with external stakeholders beyond authors and producers during the assessment process in a format such as a regional consultation, employing

the same sense of the term 'external' as explained in Section 6.2.3 and in Figure 6.2, could in theory imply that there is an assumption that the authors and producers will automatically act to 'pursue the public good' or else are able to adequately represent a very diverse set of interest groups with a stake in the assessment process. This is likely not the case in most GEAs, where the sheer volume of viewpoints, interests and stakes in the process and outcomes are too much for a relatively small group of authors, even when selected to achieve geographic and gender balance, can hope to reflect. It is also important from a democratic perspective to include stakeholders who may be affected by a decision in the decision-making process in some way. While GEAs are not authoritative in the sense that they impose rules and regulations on people, they nonetheless aim to influence policy-making and are increasingly providing solution-oriented options (see Chapter 2 in this report).

6.3.2 Summary for Policymakers (SPM) negotiations

It is important to note that policy makers as well as many authors generally view the SPM negotiations as highly valuable. Out of five government representatives involved in GEO-5 who responded to interview requests, all agreed that the SPM was a critical GEA product from the point of view of their governments, with two of them mentioning this spontaneously without being asked a specific question about the SPM. In the case of authors, while some remained uncertain about the usefulness of the SPM, all of the author interviewees from GEO-5 with whom the SPM was discussed acknowledged that the process seemed important in order to have an influence on policy (n=15). Apprehensions regarding the usefulness of the SPM on the part of authors were primarily due to the fact that many interviewees who participated in the SPM believed that the line-by-line negotiation process resulted in the watering-down of many statements. Despite this, the goal of this section is thus not to debate the usefulness of the SPM line-by-line negotiation procedure, but rather to look at more specific aspects of the procedure as practiced in different assessments in order to draw lessons learned applicable for GEO-6. Another important note for this section examining the case studies are the changes implemented between the GEO-4 and GEO-5 SPM negotiations. At the conclusion of this meeting in GEO-4, significant frustration was expressed by the author team, who perceived that the document had been watered down and changed to an unacceptable extent. Some of these authors even threatened to refuse to sign off on the final SPM as a result of this perception. Thus, for GEO-5, producers attempted to clarify the roles of different participants at the SPM meeting, and to limit the interaction between authors and government representatives to some extent in order to avoid confrontation and an unsatisfactory outcome.

6.3.2.1 Objectives

This research will examine summary negotiations for GEO-5, IAASTD as well as IPCC WGIII AR5. All three negotiations have very similar specific objectives, namely to create a summary document of the underlying assessment report specifically targeted at policy makers, which is agreed line-by-line in a negotiation meeting with government representatives (IAASTD, 2005; UNEP, 2012; IPCC, 2013). A major implicit objective of these negotiations is to create ownership amongst governments, with the ultimate goal of increasing the influence of the assessment report. This is interpreted from both the official SPM and SDM background notes (IAASTD, 2005; UNEP, 2012; IPCC, 2013) as well as from statements made by interviewees, often including terms such as "buy-in," "ownership," or "usable report" when discussing the objectives or purpose of conducting an SPM (n=16, or 67% of all interviewees with whom the SPM negotiations were discussed).

The use of the phrase "policy relevant but not policy prescriptive," employed in the official objectives of all three assessments under review in this section (IAASTD, 2005; UNEP, 2012; IPCC, 2013), suggests that there is a line that must not be crossed, albeit a poorly defined one, between what is relevant to policy and what may be considered prescriptive. It is precisely this issue which is one of the central points in debates at summary negotiations, and which also leads to the more theoretical objective of providing information to the assessment process. Government representatives at negotiations are in essence drawing the line through deliberation between what is policy relevant and what might be seen as prescriptive. By including as many governments as possible and providing a document agreed line-by-line by all the representatives, these negotiations also strive to make the report more legitimate in the eyes of policy makers. Finally, the negotiations all encouraged deliberation in some form, though the actors participating in deliberation were different in different assessments as described below.

[1] Summary for Decision Makers (SDM) in the case of IAASTD

Table 6.3.2: Summary of objectives and brief description of formats employed in SPM or SDM negotiations. *NOTE - still in development, plans to add more information (ie. scale of assessment - page count, time scale etc.) to further contextualize the data on the SPM / SDM negotiations.*

Assessment	Summary of objectives	Number and types of parties or participants	Length
GEO-5 (SPM)	Negotiate text of Summary for Policy Makers line-by-line with government representatives	Over 100 participants, including representative of 55 governments, UNEP staff and selected authors	3 days
IAASTD (SDM)	Negotiate text of global and sub-global Summaries for Decision Makers line-by-line with government	Over 200 participants, including reps of 61 governments, selected authors, IAASTD board members, and representatives from officially recognized observer organizations	5 days
IPCC WGIII AR5 (SPM)	Negotiate text of Summary for Policy Makers line-by-line with government representatives	Over 600 participants, including representative of 107 governments, selected authors, IPCC board members, and reps from officially recognized observer organizations	5 days

6.3.2.2 Means

In GEO-5, the Summary for Policy Makers negotiation took place over three days and involved nearly 100 participants including representatives from 55 national governments, at least one coordinating lead author for each report chapter, and members of the UNEP Secretariat. In the case of the IAASTD, the document is referred to as the Summary for Decision Makers (SDM), which may in theory imply a broader audience than exclusively policy makers although the terms are at times used interchangeably. The meeting lasted five days and included representatives of 61 national governments, numerous authors, IAASTD Board members and representatives of civil society, producer and consumer groups, international organizations and some private sector representatives. Finally, in the IPCC, the SPM negotiations took place over five days and involved 605 participants, including 260 delegates from 107 national governments, 53 lead authors, 26 IPCC Bureau members, 35 members of the WGIII Technical Support Unit, as well as numerous representatives from officially recognized observer organizations which consist of civil society, UN organizations, media organizations, and others. Table 6.2 summarizes the SPM and SDM negotiations' objectives and briefly describes the formats. This is done so as to facilitate understanding of Sections 6.3.2.3 and 6.3.2.4 that follow.

6.3.2.3 Implications

All three assessments, GEO-5, the IPCC WGIII AR5 SPM and the IAASTD SDM, suffered from claims that viewpoints were not well represented in the final SPM, which may indeed be unavoidable in such negotiations (Rydin, 1999; Wittmer et al., 2006; for more information see Chapter 5 of this report). In the case of GEO-5, these criticisms stemmed exclusively from authors - in fact two out of three producers and all five government representatives interviewed who had participated in the SPM negotiation for GEO-5 reported very *good* experiences with the negotiation. Thus, the new approach taken in GEO-5 as compared to GEO-4 towards the SPM negotiations, as explained earlier in the introduction to section 4, appeared to work well from the perspectives of producers and government representatives. One producer explained the changes in the SPM procedure from GEO-4 to GEO-5 as follows:

> *"…in GEO-4 we, as much as we thought we had prepared, you know, the authors and the governments for what would happen during the negotiation, when they came to the table they had, you know, they came in unprepared and therefore firing at each other anytime there was something that they didn't like. And in the case of GEO-5 […] we had set up the process as such that the authors were well informed, you know, before the negotiation took place in terms of what would happen, their role in terms of how to provide answers without trying to criticize governments in terms of their policies."*

In fact, one author noted quite specifically that there had been a marked improvement in the SPM procedure from GEO-4 to GEO-5, stating that:

> *"…in the case of GEO5 we definitely got better because at least we got the input from using the chief scientist as the mediator but we, that's again saying that UNEP is still in a steering position and you could go one stage further and really negotiate with the science community as a fully voice, but then you need more than the two days that are assigned for those meetings."*

This statement shows that a trade-off experienced in attempting to go beyond representation and enable more deliberation is that more time and resources will be required. Despite this support for the direction of change in terms of how the SPM negotiations were run, there was still strong frustration expressed on the part of authors regarding this meeting. Three authors who participated in the GEO-5 SPM, out of a total of 5 author-participants interviewed, disclosed that this was a highly frustrating exercise. All three authors who expressed dissatisfaction with the process cited a lack of deliberation between scientists and policy makers as the primary cause of frustration. The same authors further specified that this had to do with the fact that any response to government interventions were dealt with by UNEP staff who were representing authors, and only when these individuals did not feel they could adequately respond to a query or comment were authors invited to speak themselves. One interviewee stated that:

> *"I think perhaps the GEO-4 process worked better. I'm saying that although actually the Summary for Policy Makers was equally contentious as the GEO-5 one but I did feel as an author, that we had more opportunity for exploring content with a large group of authors, so with [our] chapter, I think we were initially about 20 authors and at least ten to twelve of us maintained a presence throughout the process."*

This illustrates the importance of fostering deliberation at the SPM negotiations in order to increase the satisfaction of all participants, and not forsake the satisfaction of those excluded from discussions. Another interviewee succinctly stated about their experience at the GEO-5 SPM negotiation that: *"it really felt like just sitting there quietly and watching these government actors sort of rewriting,"* again expressing frustration with the inability to respond directly and engage in deliberation. In this case, the issue of representation is strongly associated with deliberation, since authors may be physically represented at the SPM negotiation but if they are unable to deliberate meaningfully, this may not be sufficient to ensure legitimacy.

In the case of the IPCC WGIII AR5, dissatisfaction was voiced primarily by authors unhappy with the way the underlying report contributions were portrayed in the final, government-approved version of the SPM (Stavins, 2014; Victor et al., 2014). In the case of the IAASTD, there were critiques regarding the extent of viewpoints truly represented at the SDM after many representatives of the private sector visibly walked away from the process (Hilbeck, 2008; Keith, 2008). This was further substantiated by the fact that not all the governments in attendance actually signed on and accepted the final SDM, with three governments refuting the final findings of the assessment process. However, it has been noted that many of these critiques do not account for the fact that multiple viewpoints were still represented in the SDM as well as the other summaries produced by the IAASTD, and that despite the fact that not all participants approved the final SDM, deliberation was still encouraged between groups who had never before come together for such an endeavor (Scoones, 2009; Edwards, 2012). Both of these factors contribute strongly to claims that the SDM was indeed legitimate, and one interviewee speculated that claims to the contrary may have been intended to cast doubt on the report as a whole rather that actually addressing a real issue with the SDM process.

All three assessments evaluated produced multiple products communicating findings from the main reports. The IPCC WGIII AR5 has the Technical Summary, which gives authors the opportunity to produce a summary document strongly in line with the underlying report and which retains all their priority key messages. This seems to be very promising change for GEO-6 to overcome authors' feelings of under-representation at the SPM meeting; in fact, 23.5% of authors interviewed strongly supported a scientific summary that would be released alongside a negotiated Summary for Policy Makers as a way to maintain scientific credibility and legitimacy in their eyes without forsaking policy relevance and buy-in from governments. However, one interviewee pointedly identified a major issue with introducing such a scientific summary to the family of GEO products:

> *"I can imagine that [..] if you're big meeting negotiating the executive summary for policy and decision makers and you see that next to that, there is a summary where all your inputs are ignored then that's probably something you would, you can't do."*

In order for such a scientific summary to be acceptable to all parties, the function of both summaries would need to be agreed upon and made very clear from the very outset of the assessment process, for example, GEO-5's Intergovernmental and Multi-Stakeholder Meeting, where the assessment scope and products are discussed and agreed.

Sector-specific summaries of IPCC WGIII AR5 were produced externally to the assessment in a process funded by the European Climate Foundation in conjunction with interested stakeholders and other groups (see CISL, 2014). The IAASTD produced multiple regional summaries, which were also negotiated line-by-line in the same meeting as the global SDM, but there is no evidence to date that negotiating on these regional summaries line-by-line either increased or failed to increase the influence of the documents or helped achieve any other objectives. Additionally, policy briefs were prepared by a team of authors and producers internal to the IAASTD process related to specific issues, for example food security, biofuels and the role of institutions (UNEP 2008). According to an interviewee who participated in IAASTD, these short briefs were one of the most important outcomes of the process, as many people were more familiar with these than with the underlying report. In IAASTD, the briefs were not initially envisaged as a product; this same interviewee believed that planning for such ancillary reports from the outset in future GEAs could help to increase their importance even more. While such briefs were also produced in conjunction with relevant stakeholders in GEO-5, and seemed to have gained some traction beyond the original GEO-5 report, releasing even more specific, concise summaries and engaging with external stakeholders in their production seems highly beneficial for GEO in the future.

Integrating the development of such sector-specific ancillary reports into the production cycle of the underlying GEA process could serve as a leveraging strategy for facilitate enhanced stakeholder deliberation (i.e., between the target audiences of such products and GEA producers) and thereby improve both the quality of the ancillary products themselves. This seems to be of high importance given that four authors interviewed specifically mentioned having trouble identifying their target audience during GEO-5 without prompting, and given the incredibly diverse groups identified as potential target audiences during the interview. These diverse groups include NGOs, governments ranging from local to national, educators, academia, students, youth, trade and business. This variety shows the difficulty in GEO-5 of writing for a specific audience and being able to tailor a contribution appropriately. Additionally, this approach could help improve inclusivity of certain information crucial to a specific sector – but not necessarily available through traditional knowledge systems and that may not have been included in the assessment.

One method of addressing the criticisms that SPM or SDM negotiations for GEAs are overly influenced by political agendas could be through modifying existing procedures governing the influence of government representatives on the final document. For example, avoiding changes not reflected in the underlying report is an important rule and one that came up often during the IPCC WGIII AR5 SPM negotiation as a method of avoiding certain changes to the proposed SPM text. The same rule exists for GEO as well, and was certainly strengthened between GEO-4 and GEO-5 based on claims made by authors, producers and policymakers in interviews. However, some interviewees, in particular authors but also some other groups, felt that there was still a ways to go in this regard and that this rule could be further emphasized going forward into GEO-6. One comment regarding the need for further strengthening this rule was that governments may have worked around this rule by changing the emphasis of the content without changing the actual content per se, which still has significant effects on the end product. However, the presence of such rules is only half the battle; institutionalizing them is another issue altogether. For example, while the requirement to adhere to the underlying report was often used in argumentation during the IPCC WGIII AR5 negotiations, oftentimes it was authors who were using this to back up their reservations about making specific changes to the SPM document. For such a rule to have the effect in other GEA negotiations of limiting criticism that the SPM is overly politicized it seems quite necessary to encourage deliberation between stakeholders at the meeting. As prioritizing deliberation between stakeholders at SPM or SDM negotiations emerged in the interviews as a highly

important objective for the meeting, especially from the perspective of authors, it certainly seems worth considering allotting additional time for this in future negotiations. This could be done by organizing break-out or contact groups with interested individuals who are able to discuss certain contentious issues more in-depth in a smaller group than the full plenary, as was the case in IPCC WGIII AR5.

It is important to note, however, that a broader representation of stakeholders, for example including representatives of civil society, international organizations, women's groups, business and industry or others, and more time for deliberation during SPM or SDM negotiations could also mean a higher potential that conflicts will arise. In the case of the IAASTD, the conflicts that arose began long before the SDM negotiations, but peaked right before this meeting. If GEAs wish to design their SPM or SDM negotiations to explicitly foster and allow more time for deliberation, it appears to be crucial to seriously consider and plan for the potential of increased conflict between stakeholders. While it is of course nearly impossible to plan for every potential conflict, adequate preparation can help for example by having a barrage of mechanisms for resolving conflict at the ready. For more information on such mechanisms for dealing with divergent viewpoints, in particular regarding political issues in GEAs, see Chapter 5 in this report. Another important trade-off when increasing representation and the emphasis on deliberation at these negotiations, as mentioned earlier, is an increased requirement for resources, in particular the time required for meaningful deliberation with satisfactory results to different participants.

Increasing the number of summaries to more strongly reflect the target audiences of a GEA seems quite a logical move, but does not come without trade-offs. Most obviously, this would require a significant increase in resources, primarily in the form of increased time requirements for writing audience-specific summaries for multiple groups. The IPCC WGIII AR5 overcame this trade-off by engaging with external institutions in order to produce multiple short summary documents, coordinated by the European Climate Foundation, and having the very groups of stakeholders who would be the target audience for such summaries act also as authors (CISL, 2014). While GEAs are of course subject to budgetary and time constraints to different extents, it would be helpful to have a view towards releasing any additional sector-specific summaries from the very outset of the assessment in order to plan adequately for resources required for such an undertaking, or perhaps to engage more strongly with stakeholders in targeted sectors during the GEA process in order to ensure the production of such sector-specific summaries after the GEA report is released but without much added resource-use on the part of the GEA itself.

Despite difficulties in negotiating SPM or SDM documents, there is still a strong argument to be made for maintaining this line-by-line negotiation technique. As previously mentioned, government representatives interviewed argued very strongly in favor of the importance of such a document from a governmental perspective. Even though there were such a small number of interviews with governments, yielding a sample not statistically significant (n=5), this seems an important point to drive home and one that will be investigated further through additional interviews in the near future. If indeed GEAs wish to exert an influence on national decision-making, foregoing the SPM negotiations seems to be a shortsighted plan. Additionally, from the perspective of authors and experts involved in the production of the GEAs, while there remains the risk of over-politicization during negotiations, the trade-off is that their work on the GEA may have a higher degree of influence as a result of such negotiations. Strengthening the 'rules of the game' and in particular making clear the specific roles and responsibilities of different parties before the meeting, emphasizing deliberation, and improving representation, all the while still planning for potential conflict, have emerged as good rules of thumb to follow in order to maintain this important format while improving it in the face of criticisms.

In addition, producing multiple summaries or policy briefs for different target audiences may allow for a more varied influence of the GEA and also alleviate some of the doubts and fears expressed by authors and experts wanting to avoid summarizing their own work with politicized messages. The main difference between summaries and policy briefs as described here are the length, with policy briefs being shorter, as well as the focus on specific policy implications versus broader states, trends as well as policy implications. The precise number of summaries or briefs, as well as the choice between the two formats, depends on decisions that should be taken by assessment producers in conjunction with multiple stakeholders, for example in the Intergovernmental and Multi-Stakeholder Meeting convened at the very outset of each GEO process during which the scope is decided upon. However, one

suggestion could be to plan for at least one summary for each specific target audience group upon which the assessment aims to have an influence; this could include, for example, the classic summary for policy makers, but also summaries or briefs highlighting important implications of the report for business, industry, trade, civil society, women's groups, youth, and education. An alternate but not altogether different suggestion could be to engage more strongly with UNEP Major Groups and Stakeholders division, and to prepare a short policy brief for each group in conjunction with stakeholders representing each group as identified by this same UNEP division. This could not only broaden the sphere of influence of GEO, but could also foster cross-division collaboration within UNEP, strengthening the organization as a whole.

Both the IPCC WGIII AR5 and IAASTD had civil society and other stakeholders present at their SPM and SDM negotiations as observers. In both cases, while observers were able to attend the meeting, their opportunities for input were limited or non-existent and there were strict rules governing their behavior and their treatment of the information gleaned from witnessing the negotiations. There were also strict procedures for being accepted as an official observer organization, and releasing information about the precise details of the discussions was prohibited. One hypothesis put forward by an author of GEO-5 during the interviews was that perhaps having these observer organizations present would somehow limit the extent of control which governments exuded over the final SPM document. However, based on a review of opinion pieces reflecting on experiences at both the IPCC WGIII AR5 and IAASTD SPM and SDM negotiations respectively, as well as based on a few key interviews, there does not seem to be much evidence for or against this hypothesis. In both cases where observers were present at the negotiations, there were certainly still attempts to exert politically-motivated influence over the final SPM or SDM document. However, this may well be due to the stringent rules governing the roles of observers; in fact, from this analysis, the precise roles of different participants at SPM or SDM negotiations seems to be of much higher importance than the mere fact of different groups' presence or absence.

6.4 Discussion

The selection of stakeholders for engagement in a GEA emerges as a critical topic of interviews and from a review of the literature. This pertains to the selection of authors, ensuring that the 'right' coordinating lead authors in particular are chosen, but also to the necessity of having a broad representation of different domains and fields of academic study represented in author teams. While this is not the major focus of the two particular formats evaluated in depth in this chapter, it nonetheless bears mentioning that the move towards engaging experts based on achieving a more inclusive and representative group of different communities of practice, as evidenced by decisions taken at the recent first meeting of UNEA, could help to overcome some of the historical tendencies towards over-representation of natural sciences in GEAs.

GEA producers could select relevant communities of practice based on the objectives of engaging with them, all the while taking advantage of the considerable amount of theory behind this term. Engaging with groups rather than individuals may be very worthwhile, as you are engaging with a body of knowledge rather than the knowledge of a single individual. This could also inspire the creation of research communities around the GEA, as has been the case with IPCC, and could also inspire increased sharing of information within and between communities as they engage more with each other and could help to create or strengthen coalitions (for example, see the development of integrated assessment modeling communities around the work of the IPCC, as well as increasing trans-disciplinary work between researchers traditionally aligned with Working Group II and Working Group III: Moss et al., 2010; Kriegler et al., 2012). While these achievements are of course external to the assessment process itself, they can help create an ongoing process that expands beyond the start and finish dates of the assessment report. This could be fostered or hosted by the producing organizations of the assessment, for example by the new UNEP Live platform, or could be left to organize independently as has more or less been the case with IPCC. Such networks within and between communities of practice have a strong potential to increase the emphasis on process rather than procedure, which, as the interviews have shown, is of the utmost importance.

6.4.1 Caveats

The results in this research are presented with some caveats. Firstly, due to the ongoing nature of the interview process, the results are necessarily preliminary. Especially with regards to the lessons learned based on IPCC WGIII AR5 and IAASTD,

insufficient interviews have been conducted to be able to draw highly robust conclusions as of yet. This is also true for the group 'policy makers,' an important interview group given their prominence as GEA audience and consumers, but a group for which only five interviews have been conducted to date. These gaps will be addressed as the project continues over the next few months.

There are additional caveats which may not be so easily addressed as by conducting and analyzing further interviews to fill in gaps in information. For example, the selection of formats to concentrate the current analysis on was necessarily limited. This was due to space constraints coupled with a desire to conduct the analysis as comprehensively on the two formats selected as possible. Further formats which are highly interested and which were encountered during the course of this research are described in section 4.1 below. The same caveat applies to the selection of GEAs to look at. For example, an analysis of the same two formats (consultations and SPM negotiation) in the Millennium Ecosystem Assessment would have been highly interesting. However, once again, due to space and time constraints this was beyond the scope of the current research.

6.4.2 Other interesting formats

Recently, online platforms have enabled more open engagement with a broader diversity of stakeholders. One example is the online survey employed by the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) which contributed significantly to their Stakeholder Engagement Strategy. While it is too early to gauge the level of success of the IPBES approach, this concept of engaging with stakeholders to determine how best to engage with stakeholders can be seen as a major step forward in terms of acknowledging the context-specific nature of attempting to be relevant to a wide group of stakeholders as well as of the difficulty of maintaining relevance when faced with challenges such as varying expectations of the process, conflicting views on objectives, and sometimes fundamentally different worldviews. UNEP Live, UNEP's recently launched online knowledge-management platform, might be an appropriate tool to attempt such an approach. However, this would require rapid development in order to set up and implement such a broad stakeholder engagement strategy during the design phase of GEO-6, and may also involve trade-offs with other potential activities planned for UNEP Live. The IPBES strategy, which was coordinated by third parties ICSU and IUCN, took over two years to finalize; given the proposed time schedule for GEO-6, this does not seem feasible in the immediate future. However, UNEP does have the option of creating a more continuous feedback cycle with different interested stakeholders via UNEP Live, which could be further elaborated and strengthened over coming years even if not feasible for GEO-6.

Another novel option for stakeholder engagement in GEO-6 would be to better coordinate with UNEP Major Groups and Stakeholders department, who are already quite active in organizing engagement at multiple scales and could potentially provide much expertise to this aspect of the GEO process. While this strengthened partnership has already been proposed for GEO-6 (UNEP, 2014), it remains to be seen what particular form this will take, and what roles and responsibilities regarding stakeholder engagement will be allotted to Major Groups and Stakeholders, decentralized to UNEP Regional Offices, or still overseen by UNEP Division of Early Warning and Assessment, the latter of whom traditionally coordinate GEO reports. One potential role for UNEP Major Groups and Stakeholders could be to serve as or on some kind of coordinating body for stakeholder engagement activities on the same level as the Science and Policy Advisory Board or the High Level Intergovernmental Panel. Such a body could be the equivalent of a Multi-Stakeholder Bureau (from IAASTD) for example, and could help to overcome some of the challenges listed in Section 6.1.3. Felix Dodds, former Executive Director of the Stakeholder Forum for a Sustainable Future, extolled the benefits of using the term 'major groups' as opposed to civil society in a recent post on the Earth Summit website (Dodds, 2014). According to Dodds (2014), the term civil society often becomes a proxy for large-scale, Northern NGOs whereas employing the concept of Major Groups, which includes women, children, trade unions, farmers associations, and many others, can enable much broader and more representative participation, even at the regional or global scale.

Reconsidering the Review Process for GEO, for example by broadening the process to include reviewers from outside scientific disciplines through assisted review meetings, may be another way of improving stakeholder engagement. Although this form of engagement is much less 'hands-on' than an in-person meeting, for example, it can still help to increase the impact of the report as well as its legitimacy. The IPCC

WGIII AR5 held an "Expert Review Meeting" in August 2012 in Washington, DC. The goal of this meeting was to open up the review process of WGIIIs contribution to AR5 to stakeholders who may not be as familiar with the peer review process as the usual reviewers in academia and other scientific disciplines are. In this case, representatives from private sectors and civil society were invited to improve their understanding of the implications of WGIII findings and to provide comment on the report draft. While the relative success of this meeting in terms of achieving its objectives was not explicitly evaluated in the current research, it remains an interesting format nonetheless.

One potential way forward regarding stakeholder engagement in GEAs, of particular relevance during content development, may actually be best accomplished outside of the GEA process per se. A longer-term project aiming to produce visions of potentially acceptable futures, and then jointly develop scenarios in an iterative manner with input from scientific experts and many other stakeholders could help in many ways to overcome the challenges of conducting rather concise and specific meetings during the assessment process and could lead to a much longer-term collaboration between stakeholders. In this conception, groups of stakeholders could participate in vision exercises in order to determine a range of mutually acceptable future conditions, and then with experts could develop scenarios working backwards to examine different policy options to reach these ideal end points. Such an exercise could reach the full potential of co-production, moving beyond re-creating what is towards what ought to be, and could also help stakeholders to better understand the difficulties of reaching certain long-term goals and the different trade-offs involved in getting there. While such a project would necessarily require quite a long time, and would therefore likely have to be conducted outside of the regular assessment cycle, it could be highly beneficial as an alternative to regional-scale consultations during content development for example, or could potentially complement such a format if they are designed to mutually reinforce each other.

6.5 Conclusions and recommendations

Overall, stakeholder engagement in GEAs can be conceptualized as the very foundation of what makes such assessments what they are, and is seen as beneficial by most people. While there are very different conceptions of what constitutes a relevant stakeholder, and many decisions regarding the who and the how of stakeholder engagement are still made in an opaque manner, much is changing to improve such practices. The recommendations from this research are derived from process tracing based on extensive interviews, workshops and document analysis, which are then evaluated through the conceptual framework linking objectives, means and implications. Such an exercise is not simple, but can be used in both ex-post and ex-ante evaluation and may be employed during the design of stakeholder engagement approaches in GEAs in order to improve these approaches in future GEAs.

The creation of an independent, central coordinating body to oversee stakeholder engagement approaches during a GEA seems quite promising to help overcome many of the challenges identified with regional consultations, but it is important to maintain ties to lower-scale institutions in order to avoid the pitfalls of top-down advice and remain context-relevant. A broader representation of stakeholders in regional consultations also emerged as an important goal to aim for, but it is crucial that adequate consideration to the potential for increased conflict and cost associated with this be taken into account while planning the consultations. In both the regional consultations as well as the SPM negotiations, increasing the time allotted for deliberation between stakeholders could improve outcomes and overcome some of the conflicts, as well as leaving participants with a more satisfied view of the meeting. Strengthening the roles and responsibilities of different stakeholders at the SPM negotiations, and also making all parties aware of these roles before the meeting, is another way of overcoming some of the challenges identified with this particular format. Additionally, opening up a discussion of what the roles and responsibilities could potentially be, perhaps even at an early scoping meeting, could be an interesting way of arriving at mutually acceptable modalities for conducting SPM negotiations.

Finally, producing multiple summaries in addition to the SPM in conjunction with appropriate stakeholders, in particular a scientific summary but also potentially additional summaries targeted at specific sectors, could also be beneficial for GEAs. However, these would need to be released within a reasonable time after the underlying report in order to maximize impact, and would also need to be developed as an integral part of the whole GEA process to avoid seeming like an afterthought. Producing such summaries in collaboration with the stakeholder groups they are

meant to target can help to minimize the costs as well as increase the relevance and influence of such documents.

Future research could examine additional formats for stakeholder engagement, in particular regarding stakeholders 'internal' to the process, which was not examined in depth in this research. The results of the analysis in this research could also be tested and iterated with stakeholders in order to determine its relevance, accuracy and to ensure its legitimacy. In addition, more precise formats for stakeholder engagement at lower scales, such as in impact assessment, upon which much more work has been done, could be altered and evaluated for their applicability at the regional or global scales. As recognition of the integral role stakeholders play in GEAs increases, and as the focus of GEAs shifts towards increasingly solution-oriented assessments, the occasion to rethink how stakeholders are engaged in such processes is both timely and opportune. Through the conceptual framework proposed in this chapter and the examination of two particular formats employed for engagement in the past, it is hoped that future GEAs will improve their engagement of stakeholders to the benefit of the assessments and environmental decision-making more generally.

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Annex A

Background on FOGEAM research initiative

The release of GEO-5 in 2012 provided an opportunity to step back and reflect on the experiences and lessons learned from past GEOs, as well as other large-scale GEA processes, including the IPCC, IAASTD, MA, and IPBES. In this context, the Mercator Research Institute on Global Commons and Climate Change (MCC) and UNEP initiated a collaborative research initiative called "The Future of Global Environmental Assessment Making" (FOGEAM) in early 2013, which intends to inform the design and conduct of the next generation of large-scale integrated assessment processes, particularly the GEO series. Established in 2012 and located in Berlin, the MCC is an independent academic research institute. FOGEAM was advanced by the MCC Working Group on Assessments and Scientific Policy Advice.[1]

The ongoing research under the FOGEAM initiative aims to learn from past GEAs in order to inform the design and conduct of future GEAs. FOGEAM works toward establishing a deeper understanding of the evolution of GEAs and how their policy orientations have shifted in recent years. It analyzes the relationships between the objectives, procedures and methodologies, and resources of GEAs with policy discourses and investigates major obstacles and tradeoffs that have arisen in these complex and large-scale social learning processes. In view of the increasing demand for solution-orientated assessments that can support the attainment of the multiple environmental goals that have been established at the international and domestic levels in recent decades, FOGEAM puts a special focus on strengthening the procedural and methodological options for carrying out and integrating PPAs.

The main (envisaged) outputs of this research initiative are:

- The present preliminary draft report on the work-in-progress conducted under the FOGEAM project, along with a summary document prepared by MCC (see Annex X), as inputs to the GEO-6 Intergovernmental and Multi-Stakeholder Consultation in Berlin in October 2013;
- Expert workshops on GEAs to facilitate systematic reflection on contemporary GEAs by practitioners, scholarly observers, and other stakeholders;
- Building on this intermediate report, a series of peer-reviewed research articles on selected aspects that have particular strategic relevance for contemporary GEAs.

The main methodical approaches employed in the FOGEAM research include:

- Eighty semi-structured interviews (to date) with individuals engaged in various GEAs (see Annex B), at least 67 of which participated in the GEO-5 process. The interviews were mainly conducted via Skype and telephone between August 2013 and July 2014. They lasted 55 minutes on average and anonymity was assured. All of the interviews were recorded and transcribed with the participants' prior consent, and MAX QDA was used to facilitate coding and analysis;
- Compilation and analyses of a GEA metadata catalogue composed of information on 20 large-scale assessments;
- Expert workshops as a source of information and as a forum to discuss ideas. A workshop was held with Secretariat staff from UNEP-DEWA in August 2013, and another two-day expert workshop with GEO-5 authors was held in Berlin in October 2013 to identify and discuss the lessons learned from GEO-5 and other assessments (see Annex B);
- Analyses of GEA background documents, including scoping papers, meeting reports, independent evaluations, official United Nations documentation, government reports, news articles, and, of course, the assessment publications themselves;
- Literature reviews and syntheses. The peer-reviewed literature includes publications directly related to GEAs, as well as other streams of literature related to key issues of GEAs, such as contributions from STS, philosophy of science, public policy analysis, and stakeholder engagement;
- Numerous informal conversations and discussions, including with members of the IPCC AR5 WGIII Technical Support Unit, located near Berlin, several other IPCC authors from the Potsdam Institute for Climate Impact Research (PIK), and the MCC, as well as with experienced scholars working at the science-policy interface and international environmental governance;

- Reflections on and discussions with the project team members regarding their personal experiences with various GEAs. One team member (Jabbour) was part of the production team of GEO-5, and another (Flachsland) was a contributing author to the IPCC AR5 WGIII;
- Conceptual and theoretical reflections and argumentations.

Work on the FOGEAM project was advanced during a series of internal meetings (to date):
- February 2013, Berlin
- April 2013, Berlin
- June 2013, via Skype and telephone
- August 2013, Nairobi
- October 2013, Berlin
- March 2014, Berlin
- July 2014, Berlin
- September 2014, via Skype and telephone
- October 2014, Berlin

Members of the Collaborative FOGEAM Research Initiative

Prof. Dr. Ottmar Edenhofer (Director, MCC)

Dr. Martin Kowarsch*[1] (project manager and coordinator)
Dr. Christian Flachsland* (project manager)
Jason Jabbour† (project manager)
Jennifer Garard* (PhD student)
Pauline Riousset* (PhD student)

[1] Please do not hesitate to contact Dr. Martin Kowarsch in case you have any questions or comments on the FOGEAM research initiative. Email: kowarsch@mcc-berlin.net; phone: +49 (0) 30 338 5537 247.
* Researchers from the MCC Working Group on Assessments and Scientific Policy Advice
† United Nations Environment Programme, Scientific Assessment Branch

Annex B

List of FOGEAM expert interviewees and workshop participants

B.1 Expert Interviewees

A total of 80 semi-structured interviews with GEA experts were conducted from July 2013 to July 2014 with an average length of 55 minutes, mostly via skype/telephone, or in person. All interviews except for four were transcribed and coded using MAX QDA.

Of all interview respondents, 67 were in some capacity directly involved in the production of the GEO-5 assessment report. 38 of the interviewees were also involved in other GEAs, including earlier iterations of GEO, the IPCC, IPBES, IAASTD, and others.

Total number of interviews conducted	80
Interviewees involved in GEO-5	67
Interviewees involved in other GEAs apart from GEO-5	38
Average length of interview (in minutes)	55

The following list indicates the names and self-reported roles and experiences with GEO-5, previous GEOs, and other large-scale assessments for the interviewees that consented to have their names made public. This list contains names of 59 interviewees. The additional 21 interviewed persons either did not consent to having their names published, or their preference in that regard remained unclear.

	Interviewee	Experience with GEAs	Interview date	Interview mode
1	Abdullah Droubi	[GEO-5, CA] [GEO3], [GEO4]	02.08.2013	Skype/phone
2	Ada Ignaciuk	[GEO-5 , review editor], [Agricultural Outlook, Reviewer]	04.04.2014	Skype/phone
3	Adel Abdelkader	[GEO-5], [GEO-1/2/3/4], [EO Arab region (CLA)], [MA Assessment], [Arab-Millenium sub-global Assessment, Coordinator]; [Arab Region Atlas of Our Changing Environment, CLA]	29.04.2014	Skype/phone
4	Ali Darwish	[GEO-5, Audience], [GEO-2 regional consultation]	06.05.2014	Skype/phone
5	Alioune Kane	[GEO-5, LA], [GEO-4], [African Environmental Outlook]	18.12.2013	Skype/phone
6	Amy Fraenkel	[GEO-5], [earlier GEOs], [IPCC]	15.04.2014	Skype/phone
7	Anne Larigauderie	[IPBES]	10.04.2014	Skype/phone
8	Bart Ullstein	[GEO-5], [State of the European Environment, Reviewer], [Europe's Environment 3rd/4th Assessment], [UNEP Integrated Assessment of Black Carbon and Tropospheric Ozone]	31.03.2014	Skype/phone
9	Beverly McIntyre	[IAASTD]	23.07.2014	Skype/phone
10	Carol Hunsberger	[GEO-5, CLA]	11.03.2014	Skype/phone
11	Catherine McMullen	[GEO-5, LA, CA, editor]	12.03.2014	Skype/phone
12	Chirapol Sintunawa	[GEO-5, High Level Intergovernmental Advisory Panel]	13.05.2014	Skype/phone

13	Christian Holz	[GEO-5, Audience]	07.05.2014	Skype/phone
14	Daniel Ziegerer	[GEO-5, High Level Intergovernmental Advisory Panel], [GEO-4]	11.04.2014	Skype/phone
15	David López-Carr	[GEO-5, LA], [IPCC]	03.12.2013	Skype/phone
16	Detlef van Vuuren	[GEO-5 CLA], [GEO2/3/4], [MA Assessment], [IAASTD], [IPCC]	12.03.2014	Skype/phone
17	Erica Brown Gaddis	[GEO-5, CLA], [GEO-4, LA]	29.11.2013	Skype/phone
18	Erika Techera	[GEO-5]	13.05.2014	Skype/phone
19	Falk Huettmann	[GEO-5, peer reviewer through Earth System Science Partnership]	03.04.2014	Skype/phone
20	Felino Lansigan	[GEO-5, Science and Policy Advisory Board], [IPCC WG II AR3 and AR5, LA]	16.04.2014	Skype/phone
21	Graciela Metternicht	[GEO-5, coordinator], [GEO-3, coordinator]	08.05.2014	Skype/phone
22	Hans Herren	[IAASTD]	27.06.2014	Skype/phone
23	Henry Venema	[GEO-5, Audience]	11.06.2014	Skype/phone
24	Huang Yi	[GEO-5, CLA, CA, reviewer], [GEO-4, LA]	28.03.2014	Skype/phone
25	Iskandar Abdullaev	[GEO-5, LA]	07.04.2014	Skype/phone
26	Jill Jäger	[GEO-5, CLA], [GEO-4, CLA], [Assessment of Assessments of the Marine Environment], [Global Environmental Assessment Project]	12.05.2014	Skype/phone
27	John Shilling	[GEO-5, LA], [WDR]	11.02.2014	Skype/phone
28	Joris de Vente	[GEO-5, LA]	20.12.2013	Skype/phone
29	Judith Weis	[GEO-5, LA, reviewer]	13.11.2013	Skype/phone
30	Kevin Hicks	[GEO-5, LA], [UNEP WMO Integrated Assessment of Black Carbon and Tropospheric Ozone], [Global Energy Assessment], [European Nitrogen Assessment]	06.12.2013	Skype/phone
31	Laszlo Pinter	[GEO-5, CLA], [GEO-1/2/3/4], [IPCC AR3]	16.05.2014	Skype/phone
32	Linn Persson	[GEO-5, LA], [GEO-4]	14.01.2014	Skype/phone
33	Ljubomir Jeftic	[GEO-5, LA]	12.11.2013	Skype/phone
34	Magdi Abdelhamid	[GEO-5, LA]	14.11.2013	Skype/phone
35	Magnus Bengtsson	[GEO-5, LA]	02.12.2013	Skype/phone
36	Majid Shafie Pour	[GEO-5, High Level Intergovernmental Advisory Panel]	23.04.2014	Skype/phone
37	Marc Levy	[GEO-5, CLA], [GEO-4], [MA Assessment], [IPCC AR5]	25.04.2014	Skype/phone
38	Martijn Dadema	[GEO-5, High Level Intergovernmental Advisory Panel], [GEO-4]	11.04.2014	Skype/phone
39	Melissa Leach	[Audience]	01.07.2014	Skype/phone
40	Mikiko Kainuma	[GEO-5, LA], [GEO-3/4], [IPCC AR4/5]	27.02.2014	Skype/phone
41	Mirjam Schomaker	[GEO-5, expert contributor], [GEO-1/2/3/4], [GEO Yearbooks]	26.03.2014	Skype/phone
42	Narcisa G. Pricope	[GEO-5, LA]	09.12.2013	Skype/phone
43	Neeyati Patel	[GEO-5, CLA, UNEP], [GEO-4], [Marine Assessment of Assessments], others	23.03.2014	Skype/phone

44	Nicolai Dronin	[GEO-5, CLA], [GEO-2/3/4], [GEO-CC], [EEA Assessments]	07.03.2014	Skype/phone
45	Nora Mzavanadze	[GEO-5, LA]	27.03.2014	Skype/phone
46	Oladele Osibanjo	[GEO-5, LA], [GEO-3], [MA Assessment], others	05.08.2013	Skype/phone
47	Peter Gilruth	[GEO-5, Director UNEP DEWA], [GEO-4, Director UNEP DEWA], [MA Assessment, Reviewer], [IPCC, secretariat], [IPBES, Advisor]	02.04.2014	Skype/phone
48	Peter King	[GEO-5, CLA, LA], [GEO-4]	11.03.2014	Skype/phone
49	Peter M Haas	[GEO-5, LA], [IPCC, reviewer]	18.02.2014	Skype/phone
50	Renat Perelet	[GEO-5, CLA,], [GEO-4], others	11.12.2013	Skype/phone
51	Robert Höft	[GEO-5, LA], [GEO yearbooks], [MA Assessment], [GBO]	20.04.2014	Skype/phone
52	Roy Watkinson	[GEO-5, CLA]	11.11.2013	Skype/phone
53	Sandra Edith Torussio	[GEO-5]	17.04.2014	Skype/phone
54	Santiago Reyna	[GEO-5, LA]	26.07.2013	Skype/phone
55	Simon Hales	[GEO-5, LA], [GEO-4], [IPCC AR4/5], [MA Assessment]	26.08.2013	Skype/phone
56	Susana b. Adamo	[GEO-5, LA]	12.08.2013	Skype/phone
57	Susanne Dröge	[GEO-5, Science and Policy Advisory Board]	13.06.2014	in person
58	Thomas Brooks	[Audience]	07.08.2013	Skype/phone
59	Tom P. Evans	[GEO-5, CLA]	26.11.2013	Skype/phone

B.2 List of Expert Workshop Participants

On 9-10 October 2013 an expert workshop was held at the MCC in Berlin entitled "The Global Environment Outlook series – Lessons learned and future options". The following 18 participants attended the workshop.

Name	Organization, Country	Position
Dolors Armenteras	Colombia National University, Colombia	Associate Professor
Jane Barr	International Institute for Sustainable Development, Canada	Independent consultant
Erica J. Brown Gaddis	SWCA Environmental Consultants, USA	Consultant
Nicolay Dronin	Moscow State University (MSU), Russian Federation	Senior Researcher
Amr Abdelaziz Ahmed ElSammak	Alexandria University, Faculty of Science, Egypt	Professor
Christian Flachsland	MCC, Germany	Senior Scientist
Jennifer Garard	MCC, Germany	Researcher
Lawrence Hislop	GRID-Arendal	Head of Polar Programme
Carol Hunsberger	University of Western Ontario (Formerly – Institute of Social Studies, The Netherlands)	Assistant Professor (Formerly a Post-Doctoral Fellow)
Jason Jabbour	UNEP	Scientific Assessment Programme Officer
Peter N. King	Institute for Global Environmental Strategies (IGES), Thailand	Senior Policy Adviser
Marcel Kok	The Netherlands Environmental Assessment Agency (PBL), The Netherlands	Senior Researcher
Martin Kowarsch	MCC, Germany	Senior Scientist
Johan C. I. Kuylenstierna	Stockholm Environmental Institute, University of York, United Kingdom	Policy Director
László Pintér	Central European University/IISD, Hungary/Canada	Professor/Senior Senior Fellow and Associate
Pauline Riousset	MCC, Germany	Researcher
Roberto Sanchez-Rodríguez	University of California, USA	Director of the UC MEXUS
Mirjam Schomaker	Consultant environmental reporting and scientific editing, France	Independent Consultant

Annex C

Interview Guides for Semi-Structured Interviews

The questions which provided guidance to the interviews for the four major groups of interviewees: GEO Authors, GEO Producers and Experts, GEO Government Representatives, and Target Audience are listed below. The abbreviation 'GEA' is used throughout in place of 'global environmental assessment', but the meaning was of course explained to interviewees. When interviewing individuals involved in other GEAs, such as the IPCC AR5 or the IAASTD, questions were drawn from the GEO Authors and GEO Producers and Experts lists depending on experience. Due to the semi-structured nature of the interviews, not every question was posed of every interviewee; rather, interviewers concentrated on the topics and issues of most interest and relevance to each individual interviewee. The questions are presented here without any breaks, but interviewers did take the time to properly segue between different types of questions during interviews. Where official GEA documents are referenced, for example, the formal GEO-5 objectives, interviewers had these documents on hand in order to clarify if necessary.

GEO Authors

1. What motivated you to be involved to GEO-5?
2. What impacts do you think that UNEP and the governments involved in mandating GEO-5 originally wanted to achieve? What impacts did you personally want to achieve through your chapter(s)?
3. What do you think the main actual direct and indirect impacts of GEO-5 have been thus far? Were your desired impacts achieved? What potential future impacts of GEO-5 could still come to pass?
4. What is your personal view on the formal GEO-5 objectives – were they reasonable and achievable, or would other objectives have been more appropriate to achieve the envisaged impacts? Did you find the process of determining objectives to be appropriate and fair?
5. What were the main challenges you personally experienced in contributing to GEO-5? What were the main obstacles facing the overall GEO-5 process?
6. What areas of diverging viewpoints, disagreements, and conflicting interests or values did you perceive during the assessment process? When did these occur, and which actors were involved? How were diverging viewpoints dealt with during GEO-5?
7. Do you support the notion that GEAs should become less problem-focused and more oriented towards the analysis of solutions, for example through policy assessments?
8. What was the major outcome of the GEO-5 policy analysis in terms of the main policy messages? Were the GEO-5 objectives regarding policy analysis achieved? What were the main factors that led to these outcomes of the GEO-5 policy analysis? What were the main challenges with policy analysis?
9. In your opinion, what types of policy messages and outcomes from policy analyses should future GEOs envisage?
10. Did GEO-5 achieve the objective of supporting "decision-making at all levels," as stated in the mandate? What were the main challenges in making GEO-5 relevant across multiple levels of policy-making?
11. In your view, should stakeholders be engaged during the GEO process? Why? What stakeholders do you have in mind?
12. Were the methods used for engaging with stakeholders, for example the Intergovernmental and Multi-Stakeholder meeting, the Regional Consultations, or the SPM Negotiation, appropriate? What were the main challenges with the approaches with which you have had the most experience?
13. Have you observed any specific changes or a general shift over time in the focus of GEAs, or of GEO more specifically? What types of examples do you have to illustrate this?
14. Is there still a need for GEAs in the future? What type of role could future GEOs play in the universe of different environmental assessments?
15. To sum up, in your opinion, what are the most important aspects of the GEO process? What are the most important changes that should be adopted for GEO-6? Would you participate in GEO again?
16. Have we missed any important issues regarding GEO-5 that you would like to discuss?

Producers and Experts

1. To get started, could you please describe your specific role(s) in the GEO-5 process?
2. What impacts do you think that UNEP and the governments involved in mandating GEO-5 originally wanted to achieve?
3. How would you describe the broader international environmental governance agenda at the time of the mandating and design of GEO-5? To what extent do you think this context influenced the design of GEO-5?
4. Who was involved in the discussion about the scope, objectives and related potential impacts of GEO-5? Who were the most important actors? In your opinion, was there a broad sense of agreement in terms of the scope and envisaged impacts for GEO-5?
5. Do you think that the envisaged impacts determined for GEO-5 were actually achieved? In your experience, what were decisive factors influencing the achievement of these envisaged impacts?
6. What is your personal view on the formal GEO-5 objectives – were they reasonable and achievable, or would other objectives have been more appropriate to achieve the envisaged impacts?
7. In your opinion, were the available financial resources and time schedule appropriate to achieve the objectives of GEO-5?
8. Can you tell us about any challenges you may have faced in your specific role during GEO-5? What challenges did the overall assessment process face?
9. What areas of diverging viewpoints, disagreements, and conflicting interests or values did you perceive during the assessment process? When did these occur, and which actors were involved? How were diverging viewpoints dealt with during GEO-5?
10. In your opinion, what are effective approaches for dealing with strongly divergent viewpoints in GEAs?
11. Do you support the notion that global environmental assessments (GEAs) should become less problem-focused and more oriented towards the analysis of solutions, for example through policy assessments?
12. In your opinion, were the formal GEO-5 objectives regarding policy analysis successfully achieved?
13. What type of policy analysis should GEAs ideally provide in your view? For example, this might include macroeconomic policy analysis or cost-benefit analysis of specific instruments and their interactions. Can you think of positive examples where assessments did deliver useful policy analysis that supported policymaking?
14. Do you think Member States would agree to have their national policies assessed along multiple criteria through a Global Environmental Assessment?
15. Did GEO-5 achieve the objective of supporting "decision-making at all levels," as stated in the mandate? What were the main challenges in making GEO-5 relevant across multiple levels of policy-making?
16. What were the reasons for engaging stakeholders during the GEO process? What stakeholder groups should be involved in an assessment process like GEO? What impacts did engaging with stakeholders have on the assessment process or the final report?
17. Were the different approaches to engaging with stakeholders, for example the Intergovernmental and Multi-Stakeholder meeting, the Regional Consultations or the SPM Negotiation, appropriate? What were the main challenges with the approaches with which you have had the most experience?
18. How have different and changing political orientations and the evolution of the international environmental agenda influenced the GEO process and its outcomes over time?
19. Was the context leading to the GEO-5 mandate, in terms of political orientation and the international environmental governance agenda, substantially different from previous GEO contexts in the last two or three decades?
20. Have you observed any specific changes or a general shift in focus of GEAs?
21. Is there still a need for GEAs in the future? What type of role could future GEOs play in the universe of different environmental assessments?
22. To sum up, in your opinion, what are the most important aspects of the GEO process? What are the most important changes that should be adopted for GEO-6? Would you participate in GEO again?
23. Have we missed any important issues regarding GEO-5 that you would like to discuss?

Government Representatives

1. To get started, how did you become involved in the GEO-5 process?
2. What was the principal motivation of your government to engage in GEO-5, or in the GEO process more generally? Has this motivation changed over time?
3. What impacts did Member States and UNEP want to achieve with GEO-5 when it was originally mandated?
4. How would you describe the broader international environmental governance agenda at the time of the mandating and design of GEO-5? To what extent do you think this context influenced the design of GEO-5?
5. In your opinion, was there a broad sense of agreement when determining the scope and envisaged impacts for GEO-5?

6. Do you think that the envisaged impacts determined for GEO-5 were actually achieved? In your experience, what were decisive factors influencing the achievement of these envisaged impacts?
7. Which aspects of GEAs in general and of GEO-5 in particular are most interesting and useful from a national government perspective? Do you personally use GEO-5 in your work? If so, how?
8. Do you, or perhaps your government, have any reservations about the current utility of GEAs? How could GEAs be improved in order to make them more useful, in particular for policy-making?
9. Over time, have large-scale assessments (such as GEO, IPCC, or MA) become more or less useful for governments? Why?
10. In a broader context, do you think GEAs are a useful tool for building political consensus and international cooperation, or are useful for other multilateral and non-political purposes?
11. What is your personal view on the formal GEO-5 objectives – were they reasonable and achievable, or would other objectives have been more appropriate to achieve the envisaged impacts?
12. In your opinion, were the available financial resources and time schedule appropriate to achieve the objectives of GEO-5?
13. In terms of policy analysis, GEO-5 particularly focused on the exploration of regional priorities and regional policy options to speed up the achievement of internationally agreed goals. From a national government perspective, do you consider the analysis in GEO-5 satisfactory and useful?
14. Do you support the notion that global environmental assessments (GEAs) should become less problem-focused and more oriented towards the analysis of solutions, for example through policy assessments?
15. What type of policy analysis should GEAs ideally provide in your view? For example, this might include macroeconomic policy analysis or cost-benefit analysis of specific instruments and their interactions. Can you think of positive examples where assessments did deliver useful policy analysis that supported policymaking? At what scale(s) should such policy analysis be conducted?
16. How did your government ensure that its interests are respected and fairly represented in the GEO-5 findings and narrative?
17. In your opinion, what are effective approaches for dealing with strongly divergent viewpoints in GEAs?
18. Do you think Member States would agree to have their national policies assessed along multiple criteria through a Global Environmental Assessment?
19. Do you think that past and current formats for engaging with national governments during GEA processes are appropriate and satisfactory, or are there options for improvement?
20. Have you observed any specific changes or a general shift in focus of GEAs?
21. Is there still a need for GEAs in the future? What type of role could future GEOs play in the universe of different environmental assessments?
22. To sum up, in your opinion, what are the most important aspects of the GEO process? What are the most important changes that should be adopted for GEO-6?
23. Have we missed any important issues regarding GEO-5 that you would like to discuss?

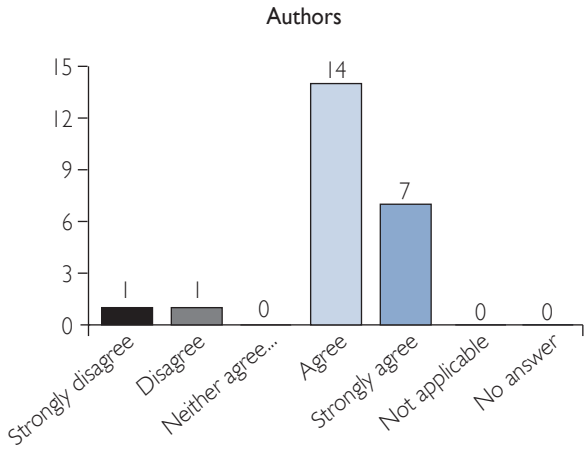
Target Audience

1. To get started, what impacts have GEAs had, either on your own work or more generally? Which GEAs are you most familiar with?
2. What would have to be changed in current assessment practices to enable increased impact of GEAs? What socially desirable potential impacts should GEAs strive to achieve?
3. Why type of public policy analysis in GEAs could be particularly useful and interesting for you? Can you think of a GEA public policy analysis that has been especially useful and interesting? What made this particular example successful?
4. Would you appreciate ex-post analyses of different policies at national, regional or international scales? Is it possible and desirable to address multiple scales and governance levels in GEA public policy analyses?
5. Are your interests as a stakeholder and your values well represented in current GEAs? In your opinion, what are the most relevant reasons for engaging with stakeholders in GEA processes?
6. Do you have any suggestions for improving the engagement of stakeholders in GEAs, including approaches which you feel have worked particularly well in the past?
7. Do you see any trends in the scope and conduct of GEAs? For example, do you observe a shift towards increasingly solution-oriented policy analysis? Have the political situation or other aspects of the context in which GEAs are conducted changed significantly?
8. To sum up, in your opinion, is there still a need for GEAs in the future?
9. Have we missed any important issues regarding GEAs that you would like to discuss?

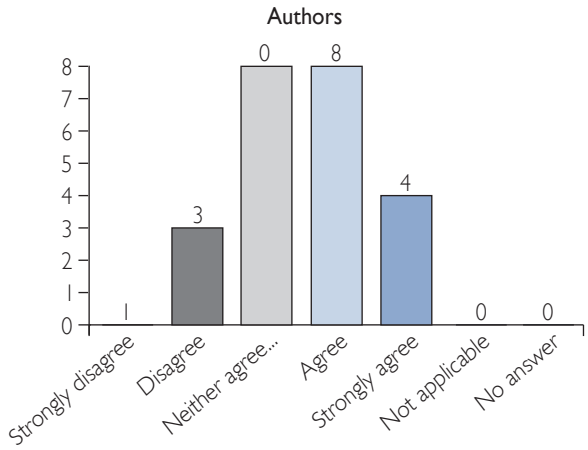
Annex D: Questions and results of interviewee background questionnaire

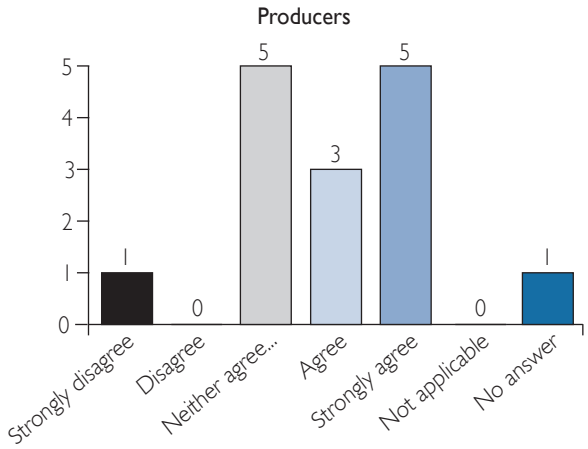
The questions contained in a background questionnaire were sent to each person who consented to be interviewed prior to the interview date. Answers are aggregated for three groups engaged in GEAs: authors, producers, and government representatives.

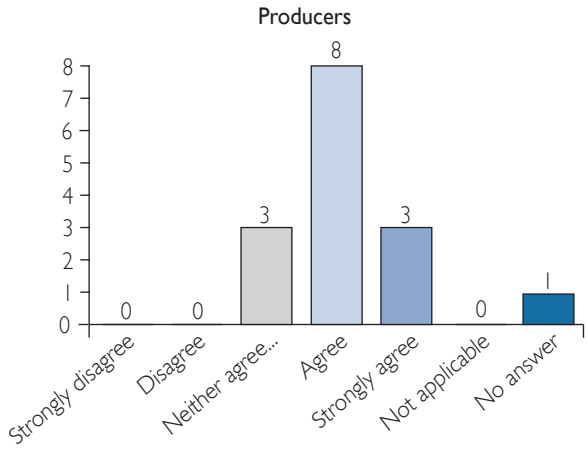
Question 1: Global Environmental Assessment (GEA) processes provide a unique opportunity for bridging science and policy.

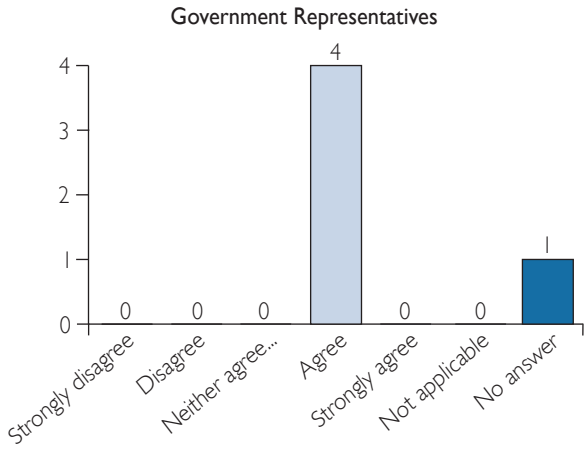


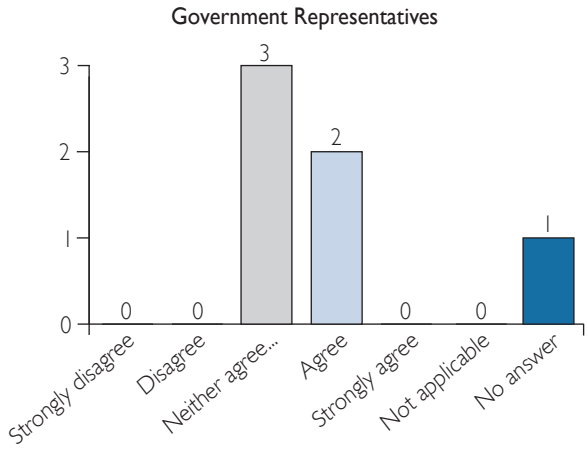
Question 2: GEAs have had considerable impacts.



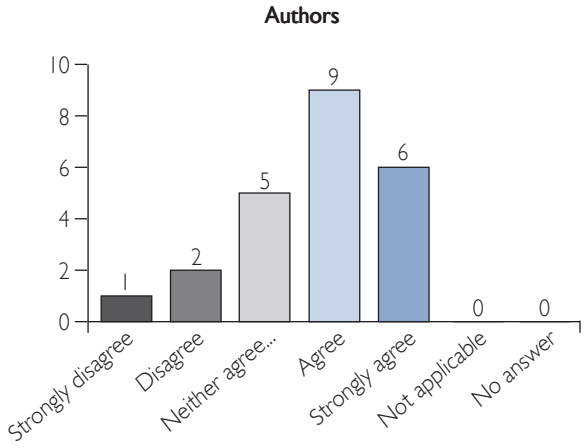


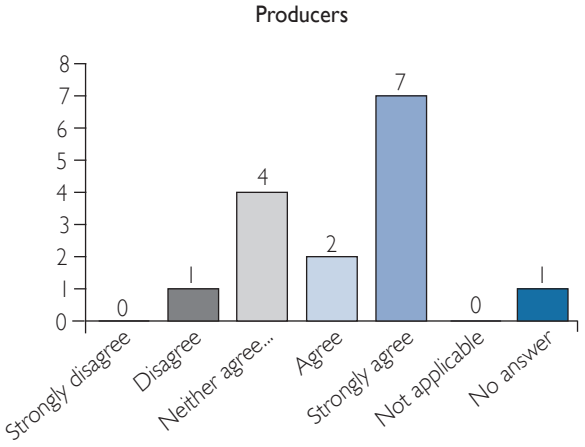


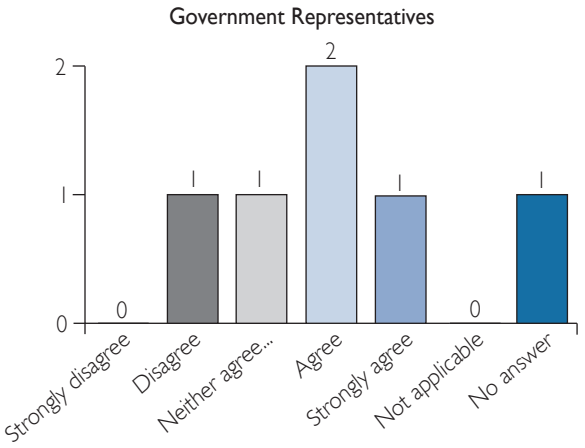




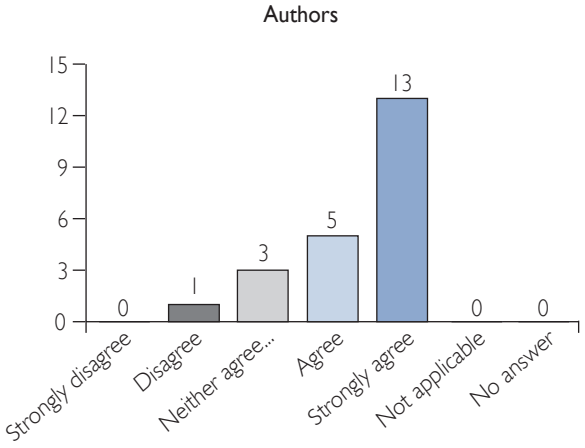
Question 3: The production of GEAs should strive to achieve the broadest engagement of stakeholders, beyonde xperts and policy makers.

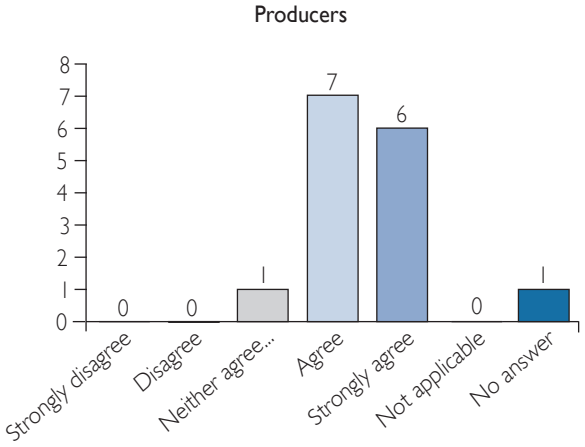


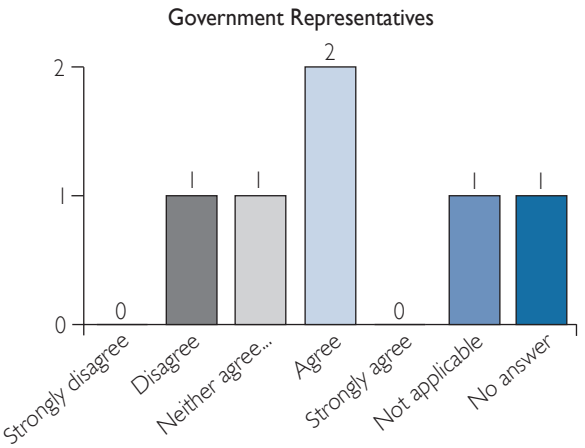




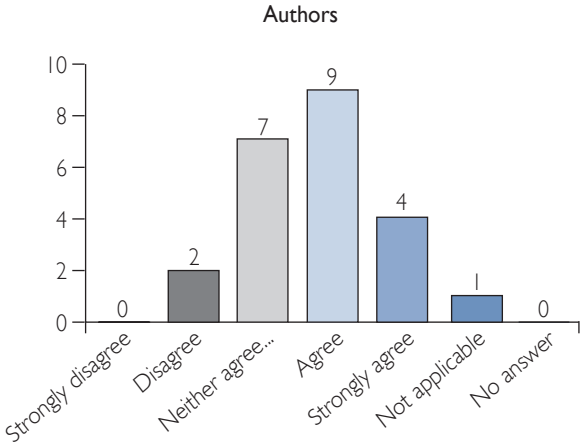
Question 4: A major challenge that GEAs face is ensuring effective coordination and sustained interaction among and between actor groups (i.e. experts, policy makers, boundary organizations).

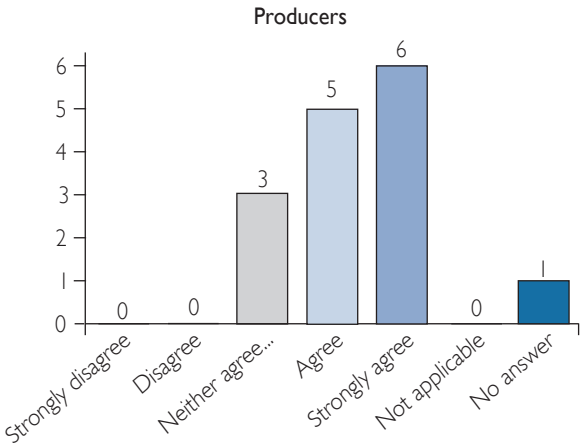


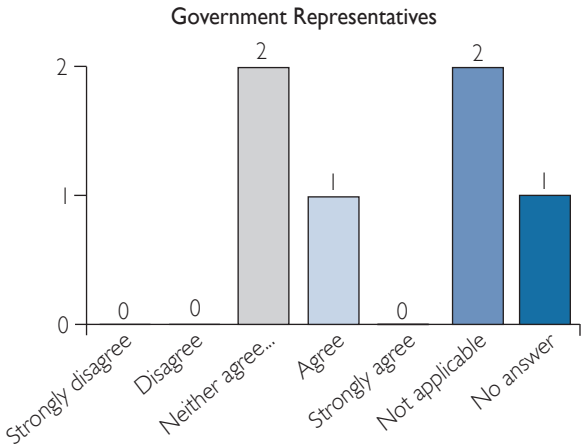




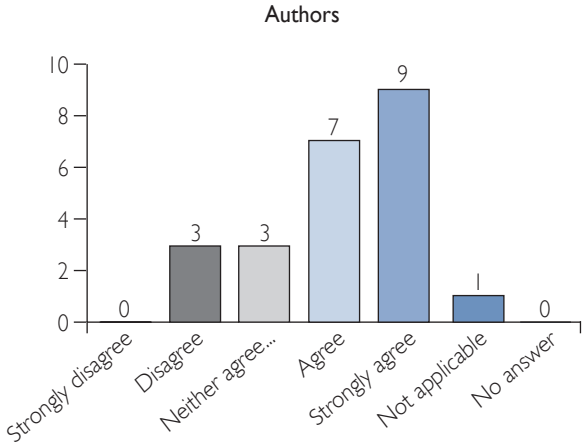
Qeustion 5: The roles and responsibilities of experts in GEAs have become more complex and demanding over time.

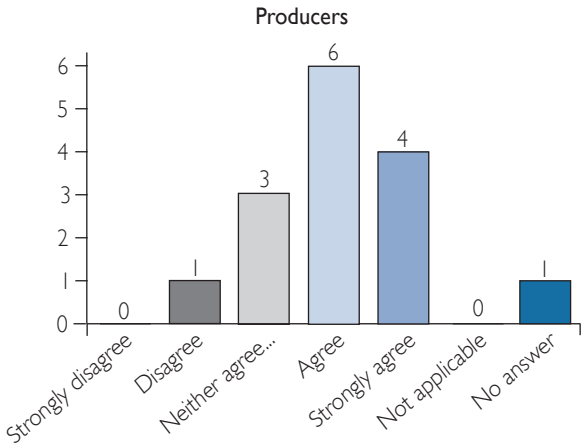


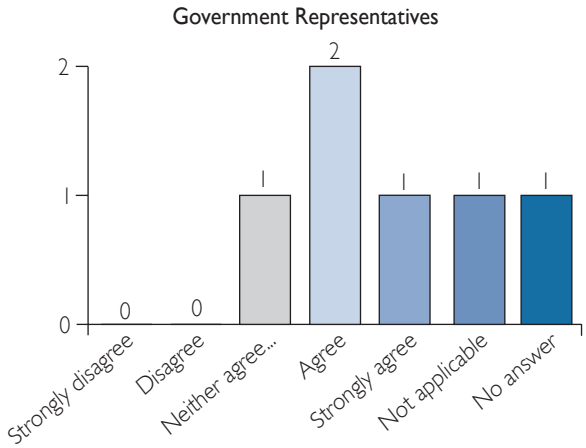




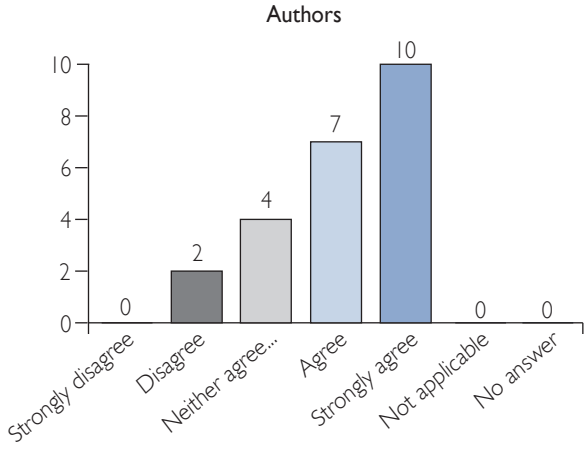
Question 6: GEAs need new strategies to deal with divergent scientific and political viewpoints.

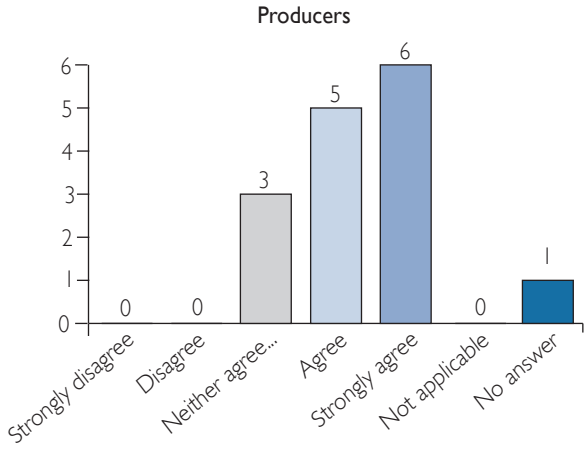


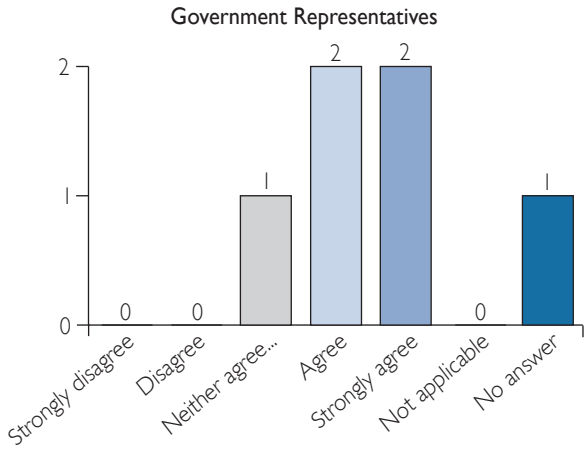




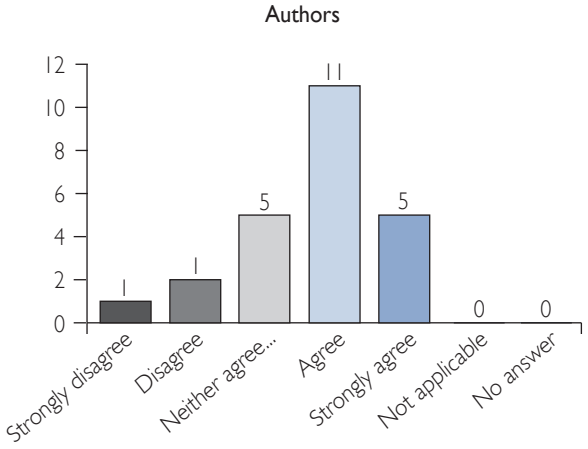
Question 7: Designing future GEAs to be more relevant across multiple scales and governance levels is a prerequisite for improving the scope and quality of their impact.

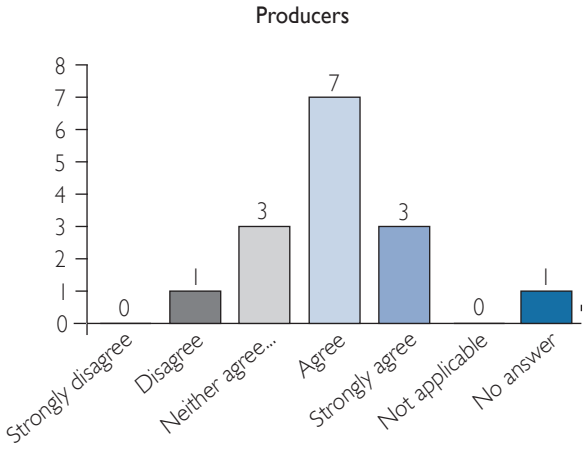


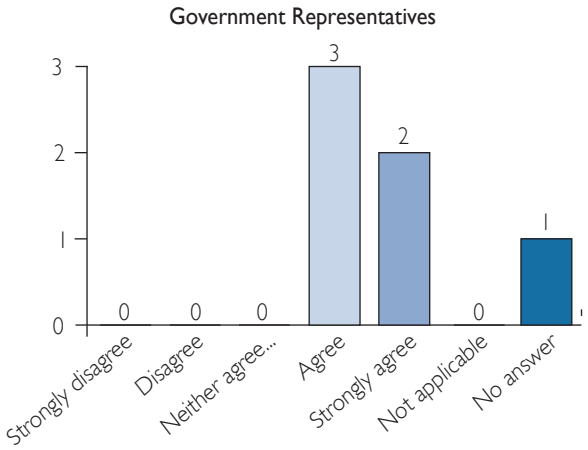




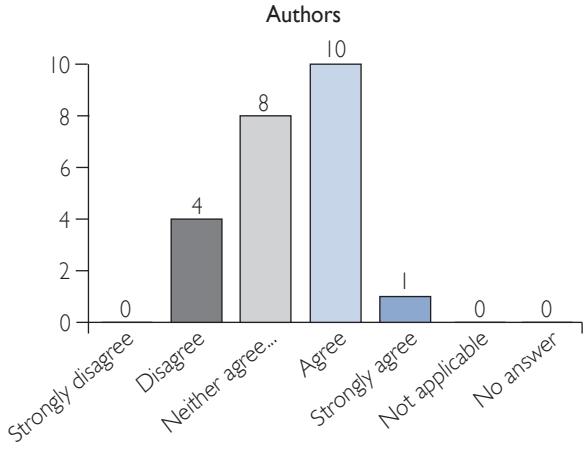
Question 8: The findings of GEA reports are likely to help multiple non-specialist audiences understand the world's most pressing environmental challenges and future trends.

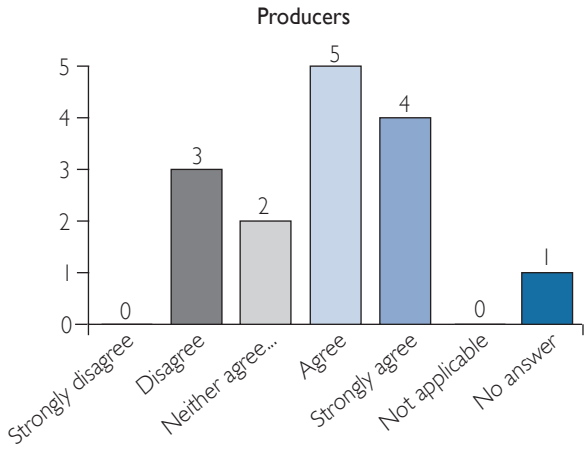


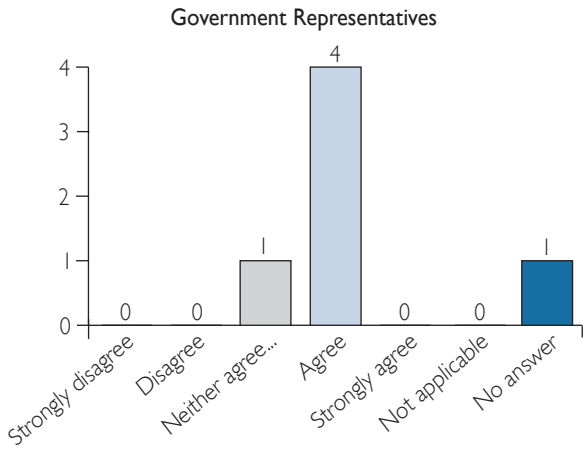




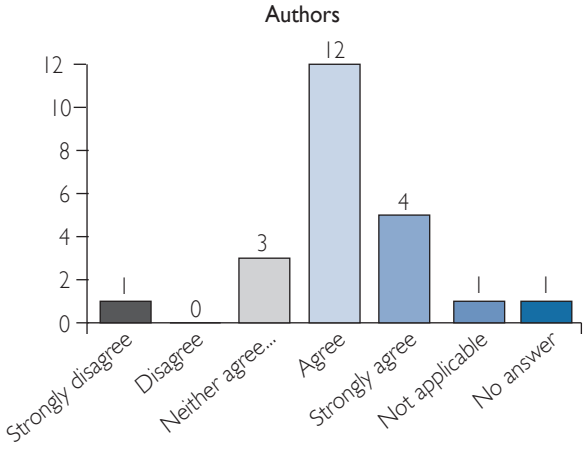
Question 9: The findings of GEA reports are likely to help countries cope with and respond to the adverse environmental and social consequences of human actions.

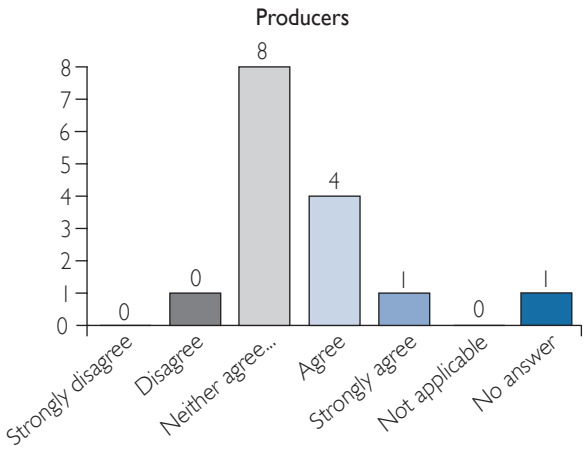


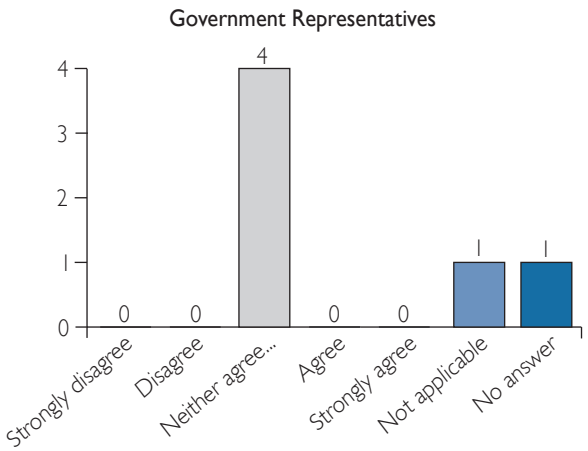




Question 10: There is a critical need for major reform of GEAs







Annex E

Background on Assessment Catalogue

The comparative metadata GEAs catalogue contains information on 20 GEAs spanning the period of 1977 to 2014. These GEAs include: (1) the Assessment of Long-Range Transport of Air Pollutants: Measurements and Findings (1977); the Atmospheric Ozone Assessment (1985); the Scientific Assessment of Stratospheric Ozone (1989); the Intergovernmental Panel on Climate Change- First Assessment Report (FAR) (1990); the Global Biodiversity Assessment (1995); Intergovernmental Panel on Climate Change (IPCC- SAR) (1995); the Global Environment Outlook (GEO-1) (1997); Scientific Assessment of Ozone Depletion; the Global Environment Outlook (GEO-2) (2000); the Intergovernmental Panel on Climate Change (IPCC - TAR); the Global Biodiversity Outlook (GBO 1) (2001); the Global Environment Outlook (GEO-3); the Global Biodiversity Outlook (GBO 2); the Millennium Ecosystem Assessment (MA)Four (2005); the Intergovernmental Panel on Climate Change (IPCC- AR4) (2007); the Global Environment Outlook (GEO-4); International Assessment of Agricultural Science and Technology for Development (IAASTD) (2008); the Global Biodiversity Outlook (GBO 3); the Global Environment Outlook (GEO-5) (2012); and the Intergovernmental Panel on Climate Change (IPCC- AR5) (2013 and 2014).

The catalogue was developed as a core component of this research and forms a significant part of the empirical data underpinning our retrospective analysis here. The main purpose of the catalogue was to facilitate the comparative analysis of key attributes and epistemic properties across a range of representative assessment processes and subsequent GEA publications occurring over the last four decades.

The decision to include a given assessment in the catalogue was influenced by three fundamental considerations: (1) a strive to achieve a representative sample of assessments including a mix of recurring and non-recurring processes; (2) sufficient access to information regarding relevant preparatory and background documentation (i.e., authorizing mandates, participants lists, operating budgets etc.); and (3) large-scale assessments that were 'global' in their scope both in terms of domain coverage and participation.

The following list of documents was analyzed as part of the data-gathering exercise for developing this catalogue:

- Grey literature background documents, scoping papers, meeting reports, independent evaluations, UN documentation (e.g., resolutions of the UN General Assembly, decisions from UN Governing Bodies);
- Official UN background Information Documents in support of inter-governmental meetings etc.;
- Government reports;
- News articles and media releases;
- Peer-reviewed papers; and
- The assessment publications themselves.

The development of the catalogue, which was initiated in March 2013, involved collecting, collating, synthesizing and coding information, and, where necessary, digitizing selected texts from earlier GEAs (e.g., key messages, assessment objectives etc.) to facilitate comparative discourse analysis. The selection of attributes and the information categories included in the catalogue was informed by several discussions within the FOGEAM research group, various GEA practitioners, as well as the outcomes of a two-day experts' workshop, reflecting on the experiences of GEO-5.

The following is a list of data categories attributes included in the catalogue. Information on specific selection criteria, as well as the structural and methodological details of the catalogue, including descriptions and definitional characteristics will be made available in course of the next two months (this information will be made available on the GEO-6 CoP working Group on assessment methods).

Participants

- *Total number of authors*
- *Peer Reviewers*
- *Expert contributors (non-author contributors)*
- *Expert Advisors*
- *GEA Chair(s)*
- *Expert panels/ committees*
- *Number of Countries involved formally involved in the assess*
- *Coordination/ production teams*
- *Total GEA participants+*
- *Lead Organization(s)*
- *Partnering organizations (i.e., collaborating institutions)*
- *Stakeholder/ wider public consultations (number, location)*

Coordination, production and sponsorship

- *Production schedules (assessment time frame)*
- *Budgetary information (operational budgets)*
- *Government sponsorship; co-sponsoring agencies*
- *ToRs (stakeholder)*

Rationale and background

- *Factors precipitating inception/ establishment*
- *Formal Scope and Process*
- *Formal/ informal alignment with MEA*
- *Formal/ informal alignment with Intergovernmental processes*
- *Scholarly reflections on outcomes, rationale*

Institutional setting and political context surrounding GEA

- *Relevant scientific, international policy, sociopolitical events surrounding GEA*
- *Intergovernmental meetings, conferences, events*
- *Relevant declarations/ resolutions/ endorsement*
- *Multilateral Agreements*

Objectives

- *Authoring mandates*
- *Formal objectives*
- *Principal Objectives (Highest order)*
- *(2nd order) (Sub-objectives)*
- *(3rd order) Key framing questions/ investigation questions*
- *General nature of objectives*
- *Method focused objectives and framing questions*
- *Solution/ response oriented objectives*

References (bibliographic data)

- *Number of citations (per chapter)*
- *Types of source materials*

Key messages *(digitized to facilitate discourse analysis)*

Annex F

The Global Environment Outlook series – Lessons learned and future options

Summary of GEO Expert Workshop

9-10 October at MCC Berlin

Workshop Objective: The primary goal of the workshop was to gain insights about the GEO-5 process and learn from authors' experiences. While we this solicited feedback during workshop, we also wanted to give experts a chance to let us know how they perceived our research hypotheses and overarching objectives for the FOGEAM initiative. As such, the workshop was used to solicit views and impressions on a provisional set of guiding questions for the research project including the semi-structured interviews. Using the initial findings from a preliminary review of relevant literature and documents, a set of 15 interviews, the project team proposed a series of potential lines of investigation to be explored and addressed in the final project report and subsequent papers. Finally, using a series of targeted breakout sessions and targeted presentations, participants were asked to deliberate and offer their ideas for a range of initiatives, specific actions and interventions that could improve and help guide the future direction of the GEO process. During the course of our deliberations, workshop participants conceived of several recommendations and inputs, building on the foundations laid and experiences gained from GEO and other GEAs.

The following is high-level summary of key interventions, inputs and recommendations:

1. The need for a more regionally-driven and regionally focused GEOs using a series of bottom-up processes that were described by many and being more akin to the GEO-3 model;
2. There is a need for improved coordination and coherence on the part of UNEP in terms the overall GEO storyline and narrative emphasis regarding central objectives;
3. There is a need for better Secretariat guidance and support, in terms of pre-established analytical frameworks and methods that could facilitate the policy appraisal task;
4. Improved continuity between the assessment objectives (bigger picture) and the aim of the regional consultations - perhaps with the exception of LAC....this region seemed satisfied with the consultation;
5. There is a need to critically reevaluate the traditional Report Structure that the previous four GEOs followed, including the thematic domains contained in the State and Trends (SoE) section and their relationship to other aspects of the report;
6. One core recommendation provided by the group at large, was to use the concept of nexus issues – structuring the report storyline around interlinking issues such as food security, Sustainable Development Goals, water-land-climate;
7. Administrative and organizational issues hindered the GEO-5 process and put undue stress on several CLAs and lead authors— as such, arriving at agreement over issues requiring UNEP leadership – sequencing preparatory steps etc. should be given more careful consideration in future GEO processes;
8. Availability and willingness of experts was an issue that came up at several points during the deliberations, several experts felt that the burden of responsibility was not evenly shared and there was very little/ no accountability structures put in place to ensure minimum contributions were actually met;
9. There was perceived need to diversify the disciplinary and thematic expertise that GEO employs, in terms of more contextualized regional experts, policy experts (economics and public policy analysis), sustainability science experts, and social sciences and the humanities;
10. There was a strong desire and interest on the part of most participants to use more innovative web-based multi-scale and cross-reference platforms/ technologies to diversify and update the mediums of presentation as well as knowledge integration; several experts requested more information about UNEP Live – its envisaged functionality and relationship to future UNEP assessment processes;
11. The need to develop key methodologies earlier in / before the process (pre-assessment framing activities, e.g. complementary, in-depth and integrated policy report) and the need to provide clear guidelines on the application of such methods;
12. Participants raised concerns of the SPM process and suggested a critical re-think of how such a document could come together without compromising the integrity of the report and/or disenfranchising expert contributors;
13. Participants recommended two-tier summaries: Split researcher (authors summary) and government summary

MCC
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Background Paper for the Intergovernmental and Multi-stakeholder Consultation on the Sixth UNEP Global Environment Outlook (GEO-6)

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ABSTRACT

Charting alternative policy pathways and their likely implications through a multi-stakeholder process can be a useful exercise in addressing the challenges of re-orienting contemporary Global Environmental Assessments (GEAs) from a dominant focus on problem analysis to solution strategies. The development of such pathways will benefit from continuous monitoring of key policy indicators that help evaluate the status of policy-goal attainment, and from retrospective appraisals of specific policies at various scales. Investments into building social science policy assessment capacity in the mid- to long-term could therefore enhance the saliency and impact of future GEAs. Given the limited resources of any GEA process and the need to ensure their scientific credibility, careful choices need to be made in specifying the mandated scope and objectives of emerging GEAs.

It's been nearly 40 years since the first large-scale scientific assessment of global and environmental scope was initiated. Global environmental assessments (GEAs) have arguably become one of the most systematic, deliberative, comprehensive and integrative modalities for assembling, synthesizing and organizing scientific information. More importantly, GEAs have been seen by many to be very useful and deeply influential tools for catalysing cooperation at the science-policy interface, and arriving at consensual evidence-based knowledge to inform policy discourses and decision-making.

Nevertheless, GEAs have shared a complex and sometimes uneasy coexistence with policy-making systems and international governance regimes, where scientific debates and political ones, not surprisingly, often overlap and clash. Balancing the imperatives of legitimacy, saliency and scientific credibility has proven to be a continuous challenge for GEAs. The practice of conducting GEAs has also given rise to various structural and normative obstacles, including but not limited to, the objective treatment and integration of divergent viewpoints, complex issues of scale and cross-scale interaction (in social, political and natural systems), fair and inclusive stakeholder engagement, and the management of an increasingly vast and fragmented landscape of often uncertain information and data across disparate knowledge systems.

Amidst the evolving political and institutional contexts that GEAs are embedded in, and a broadening of knowledge needs, including a push towards solution-oriented enterprises, the GEA practice finds itself at crossroads. Today, a growing number of actors at the science-policy interface, and within the GEA community, are calling for reforms and questioning whether certain GEA modalities remain fit for purpose. Four decades offers a good vantage point to reflect on the evolving character, dominant focus and shifting orientation of contemporary assessments.

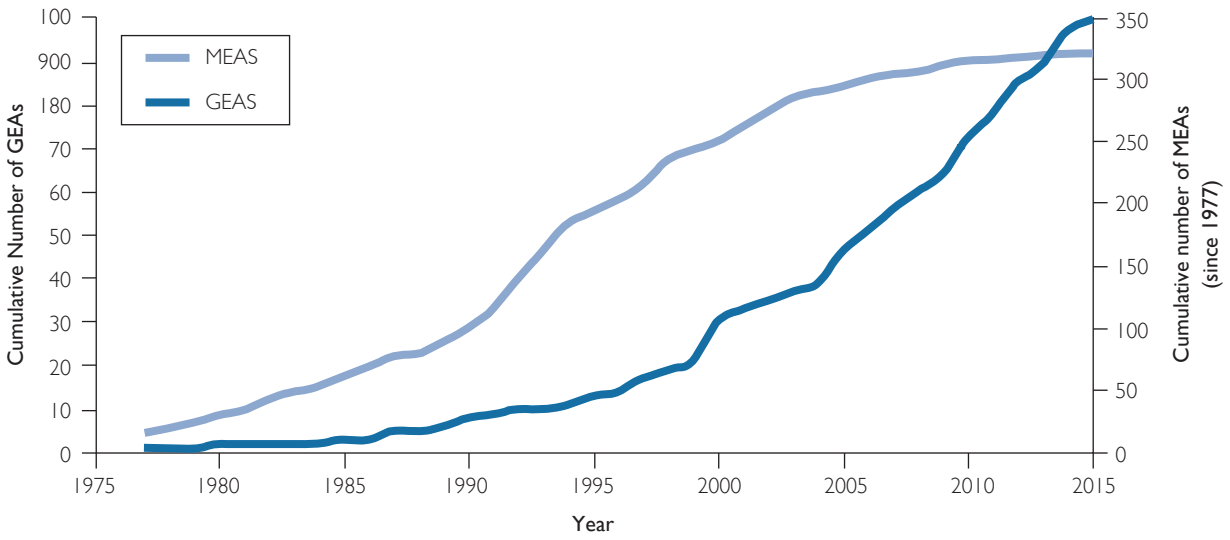

Figure 1 - *Constitution of the institutionalized global environmental policy discourse domain: Cumulative number of Multilateral Environmental Agreements and completed GEAs since the late 1970s.*

A retrospective analysis of international scientific assessments reveals that the genesis of GEAs is closely and significantly connected to the birth of environmental multilateralism. Figure 1 shows the cumulative growth in adopted Multilateral Environmental Agreements (MEAs) and completed GEAs beginning in late 1970s. It also reveals the more recent and rapid proliferation of GEAs, where more than 60% of all large-scale assessments produced to date have occurred in the last ten years. Taken together, GEAs and MEAs have opened a new space for global environmental policy discourse.

This background paper, produced as input to the GEO-6 Intergovernmental and Multi-stakeholder Consultation, aims at discussing how the opportunities offered by this global discourse may be harnessed more effectively in the future by adapting GEA processes. The basis for this paper is the work-in-progress under the MCC- led FOGEAM collaborative research initiative and its preliminary findings, empirical observations and conceptual arguments which we hope will inform the deliberations on the preparatory design phase and scoping of GEO-6. Here, we present a summary of five key messages that shed light on the emerging challenges facing contemporary GEAs and discuss potential response strategies. A concluding section offers some final reflections on options for the scope and objectives of GEO-6.

1. Major changes from assembling knowledge to managing complexity, and the shift to solution oriented GEAs

Over the past three decades, GEAs have experienced a number of significant changes, including a discernible rise in epistemic and process complexity. As a result, they have also become more comprehensive and elaborate. Another important change is the increasingly prominent shift in GEAs, from problem- towards solution-orientated enterprises.

Several indicators illustrate the increasing epistemic and process complexity of GEAs. Figure 1 documents the dramatic rise in number of references and source materials used in the the five successive iterations of the GEO and IPCC reports, revealing six and 10-fold increases respectively, from the first reports to the most recent. Citation analyses reveal an exponential increase in the underlying peer-reviewed literature on the topic of climate change . Partly as a response to this challenge of an increasing body of knowledge, the number of authors and expert contributors of large-scale GEAs has also risen consistently (Figure 2). In addition, the length of large-scale GEA reports (including GEO) has increased linearly over time. The IPCC assessment reports exhibit a nearly five-fold increase in the combined total (WGI, II, and III) page count, with the First Assessment Report (FAR) featuring 911 pages, and the most recent iteration (AR5) at 4,300.

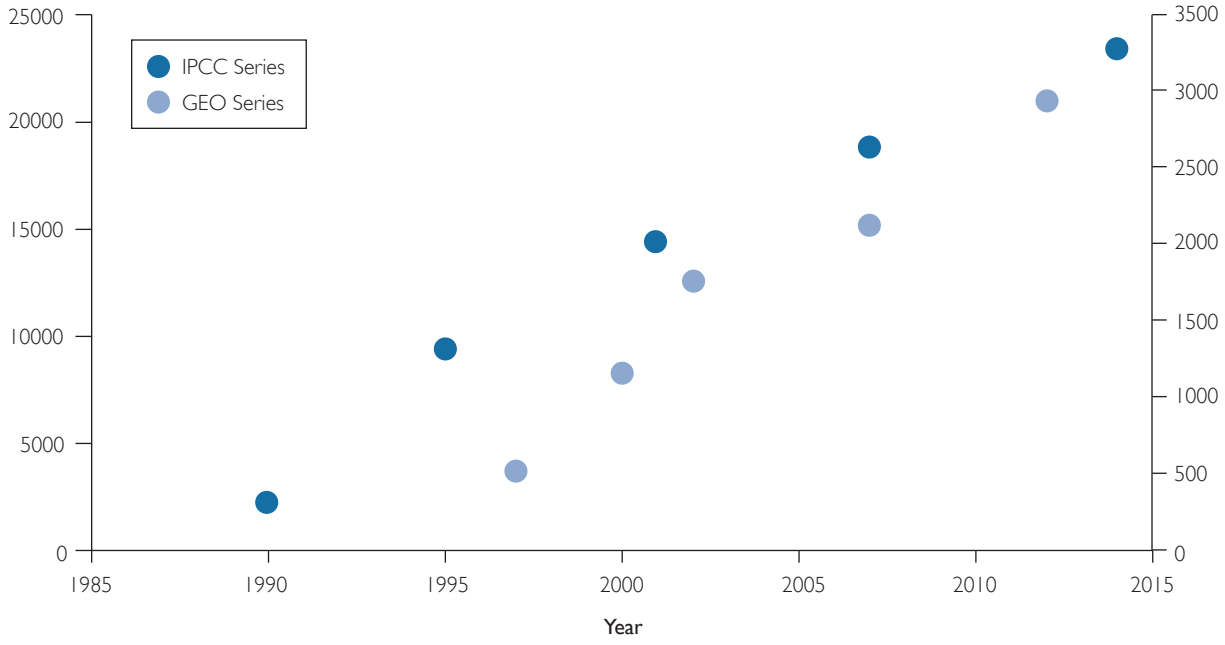

Figure 2 - *Trends in the number of references/ source materials used in recurring GEO and IPCC assessment over five successive iterations. The left vertical axis indicates numbers for the IPCC, the right hand axis for GEO.*

The growth of complexity in the task GEAs are facing is also indicated by a substantial rise in the number of mandated objectives per assessment (Figure 4). The number and range of specific scoping and framing questions that assessments are expected to address (now a prominent feature of intergovernmental GEAs) has also increased significantly. Moreover, of the GEAs assessed, there was no evidence of any deliberate prioritization or ranking of such objectives; thus, leaving their relative importance open for interpretation.

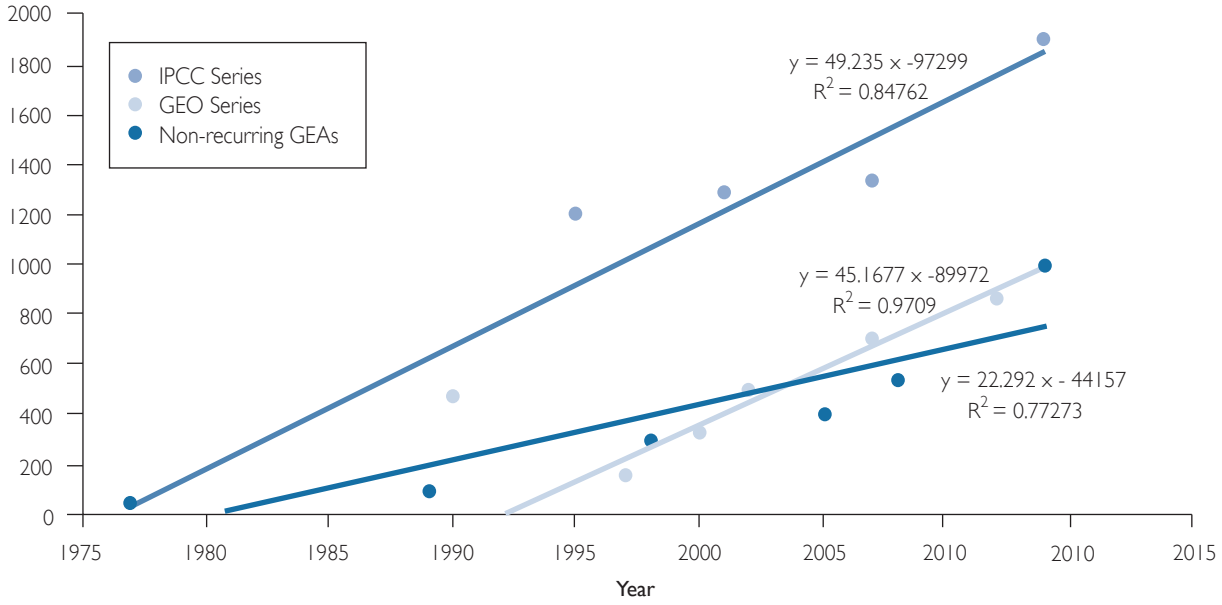

Figure 3: *Trends in the number of authors and expert contributors for GEO series, IPCC, and several non-recurring GEAs.*

In addition to these changes, contemporary GEAs exhibit a deeper engagement with, and emphasis on future outlooks, response strategies, action-oriented narratives, and to varying degrees, public policy analysis. This is reflected in both the evolution of institutional objectives and authorizing mandates for GEAs processes, and their aggregate outputs, where 44% of the content presented in GEO-5 represented solution-relevant material. Discourse analyses on 320 source materials of four GEAs[1] from 1985, 1995, 2008, and 2012, reveals an increasing reliance on solution-focused information with 0%, 12%, 47% and 55 % respectively. Taken together, these changes correspond to the perceived shift towards solution-oriented GEAs expressed by many stakeholders and researchers interviewed in the context of the FOGEAM project.

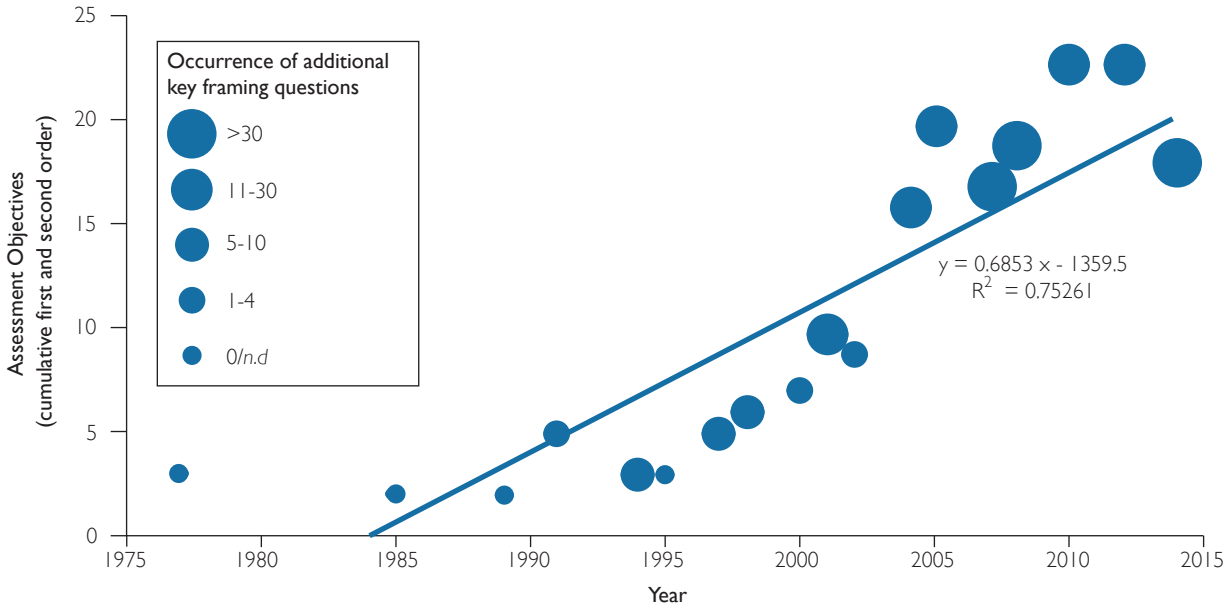

Figure 4: *Increase in the extent and scope of assessment objectives over time. The size of a data point represents the occurrence of additional key framing questions.*

This shift towards solution-orientation of GEAs is likely attributable to recent changes in the global political arena where environmental issues have become more mainstreamed (particularly in the context of sustainable development) and where a number of international policies and regimes have been adopted, but lack appropriate means of implementation. As pervasive environmental problems persist, key stakeholders appear to be increasingly interested in a better understanding of the trade-offs across multiple societal objectives (including macroeconomic and social) that alternative future policy scenarios will imply.

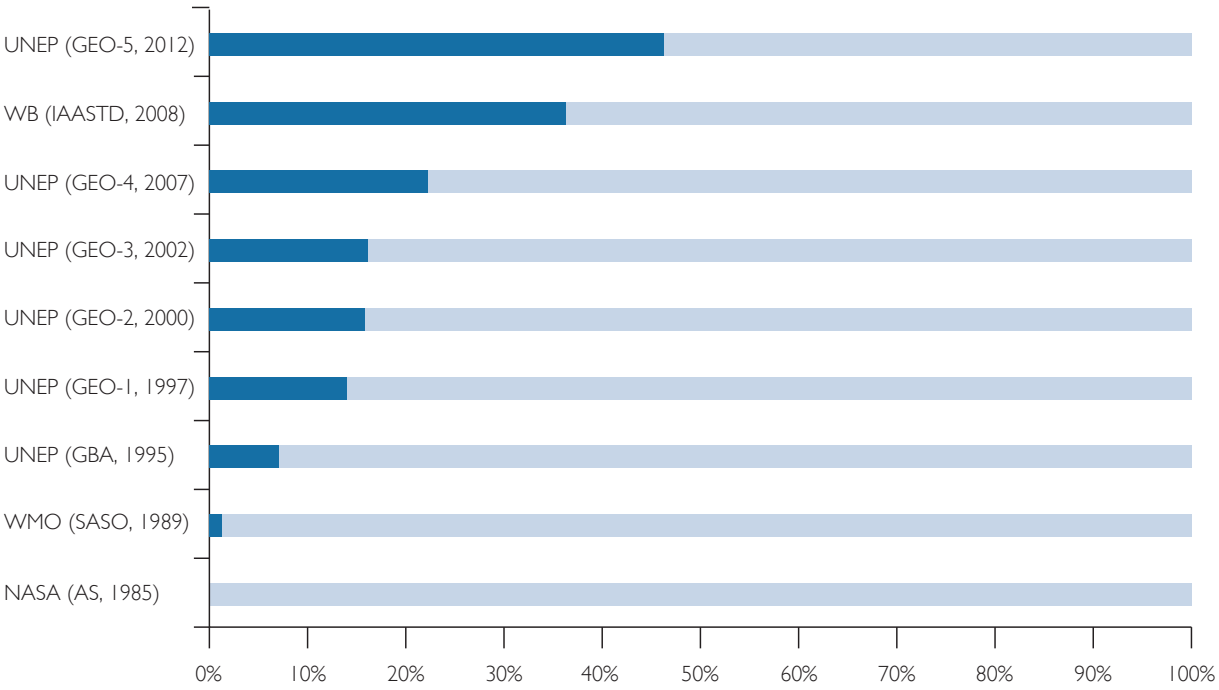

Figure 5: *Proportion of selected GEA reports representing solution-oriented material, analysis and findings as reflected in narratives, graphical illustrations, tables, data and supporting imagery.*

An increasing focus towards solution-oriented public policy assessment in GEAs would offer the opportunity of enhancing the quality of public policy discourses by providing answers to salient policy questions. Ultimately, this can enable, replace and/or have the potential to improve the existing flows less reliable, and highly fragmented forms of policy information. Solution-oriented policy assessment in GEAs, as enterprises with a distinctly *global* scope, bear three distinct opportunities: (i) Informing and potentially facilitating deliberations over and the implementation of global and international policy regimes; (ii) facilitating the diffusion of domestic policy lessons and related collective learning processes across regions, and sometimes disputing stakeholder groups; and (iii) supporting environmental policy agenda-setting processes by initiating more explicit, systematic and rational public discourses on the suitability of alternative policy instruments and measures.

2. Emerging challenges: Complexity managment and policy assessment

These changes are giving rise to a number of challenges. The increasing epistemic and process complexity of GEAs renders process coordination and goal attainment ever more difficult, and resource-intensive. The shift to the analysis of potential policy solutions in GEAs is accompanied by several fundamental challenges: The complexity of the domain of international environmental governance (IEG); prevailing research gaps in research on policy options; the pervasive uncertainty of policy-related knowledge; and the disputed normative implications of such research.

The challenge to integrate an increasingly vast and diverse body of scientific knowledge to serve the rapidly expanding demands of target audiences is pushing the capacities of GEA teams towards their "feasibility frontier", where difficult trade-offs are arise. For example, while enlarging page counts and producing increasingly voluminous reports allows for a wider range of topics to be covered with more depth, it also reduces accessibility of an assessment. Increasing the size of author and production teams, and expanding rigorous peer-review processes renders process coordination ever more costly and demanding. The proliferation of GEA objectives and the broadening of their scope risks diminishing the intensity of the analysis, creating confusion and friction among experts, and exposes assessment processes to be diverted by peripheral issues. In the absence of additional guidance and/or stricter measures on the development of GEA objectives, many assessment processes could soon be besieged by their own mandates and unwieldy bulk.

One of the main challenges of moving toward solution-orientated of GEAs is the fundamental complexity and high-dimensionality inherent in global environmental governance domain. Among the multiple interacting dimensions that need to be specified in any policy assessment are time (past vs future), multiple spatial and governance scales, multiple sectors (including environmental and economic), multiple objectives motivated by multiple actors, and multiple methodologies that may employed in the assessment (including the treatment of uncertainty). These dimensions combined result in a staggeringly complex domain of knowledge that is virtually impossible to address comprehensively within a single GEA. Second, the current lack of policy research on many of the uncomfortable questions that solution-oriented GEAs are addressing (e.g., on human behaviour and political action) makes it

difficult for them to develop the required knowledge syntheses. Third, pervasive uncertainty in much of the social scientific knowledge that is available imposes challenges of how to conceptually manage and communicate these uncertainties to GEA audiences. Fourth, the often politically contested nature of policy analysis at the national level render GEA processes subject to internal and external conflicts in discussing related divergent viewpoints that are often value-laden. In addition to these challenges, the absence of broadly accepted conceptualizations and methodologies for policy assessment in GEAs has impeded their design and conduct in the past, including in GEO-5.

3. Response options: The importance of focus and alignment of objectives and means

Responding to the challenges associated with increasing epistemic and process complexity of GEAs requires a targeted re-orientation of contemporary GEAs. In general, responses should be guided by an improved strategic alignment of (i) the scope and objectives of GEAs; (ii) the provision of appropriate means and resources (methodologies, frameworks and procedures, expertise, time, funds); and (iii) the broader context in which GEAs are situated in terms of relevant policy discourses and imminent policy questions. As an interim measure, one specific option for facilitating this alignment is to reduce the scope and objectives for a given GEA.

As several expert observers have suggested[2], more narrowly defined scope and objectives for GEAs would mean addressing only targeted questions within a GEA that are particularly relevant for specific policy discourses. Importantly, this implies deliberately restricting the temporal, spatial, sectoral and other relevant dimensions of the analysis during the inception and mandating of future GEAs.

Such considerations should to take into account the trade-offs between resource-intensive GEAs providing more comprehensive, integrated knowledge synthesis on the one hand (such as the IPCC assessments), and less onerous but narrower niche contributions to policy discourses on the other (such as the UNEP Emissions Gap Report). Considerations over the scope of GEAs should also take into account the possibility of optimizing the effects of improved coordination across the emerging landscape of GEAs to ensure that, in aggregate, sufficient quality information on the overall policy domain is provided to policy discourses. In view of proposals for GEO-6, the broad scope and range of objectives in terms of reviewing both environmental challenges as well as promising policy pathways in all world regions as well as the global level, combined with an ambitious time frame that would have GEO-6 finalized by either 2016 or 2018, begs the question of whether the implementation and delivery of these outputs could be deliberately and strategically sequenced.

4. Policy assessment: Mapping future pathways

One option for responding to the challenges that solution-oriented GEAs face—in terms of the pervasive uncertainty and the disputed normative implications—is to conceptualize them as scientific mapping exercises of alternative future policy pathways and their likely implications, including trade-offs among multiple objectives, potential risks and uncertainty. This should be strongly based on systematic retrospective (ex-post) learning from specific policies. Resultant "dynamic maps of knowledge" can potentially catalyse collective, rational and iterative learning processes in contested public policy discourses without being policy-prescriptive. Expressed in metaphorical terms, such maps can support policy-makers in navigating the political solution space. Policy assessment exercises could benefit from well-designed inclusive stakeholder engagement processes, and would ideally respond to specific and imminent questions in contemporary public policy discourses.

The formulation, implementation and reform of environmental policies at various levels of decision-making will continue to be a dynamically evolving and experimental process in the years to come. GEAs can improve the quality of policy-making by synthesizing and disseminating *ex post* policy lessons, as well as *ex ante* analyses of policy options and how they impact multiple social objectives (including macroeconomic and social). This can inform and enhance the quality of policy discourses and ultimately decisions over the adoption of alternative future policy pathways. Figure 6 provides an illustration of such a conceptualization of policy assessment in GEAs.

The conceptualization emphasizes various options for drawing lessons from historical policy experiments. First, providing monitoring functions by assembling policy-relevant historic indicator data might provide basic information both on the state of the environment, and the state of policy responses. If this approach is pursued in GEO-6, it can build on and develop the UNEP Live platform to aggregate and disseminate relevant data and indicators. Comparing the historic development of such descriptive indicators with past policy objectives (operationalized as goal values of indicators) can offer lessons on whether societies are on track to meeting their objectives or not – the latter signalling a need to re-orient high-level policy attention towards imminent policy failures. Such a function, pioneered in GEO-5, could also benefit from knowledge management capabilities and improved data flows made available through UNEP Live. Third, assessment of case-specific counterfactual analysis can reveal lessons on the distinct impacts of specific policies. Regularly aggregating and updating such lessons within GEAs offers the potential for a systematic process of cumulative 'global environmental policy' learning. However, this is a highly resource-intensive exercise if a broad scope for analysis is adopted in terms of considered policies or spatial extent.

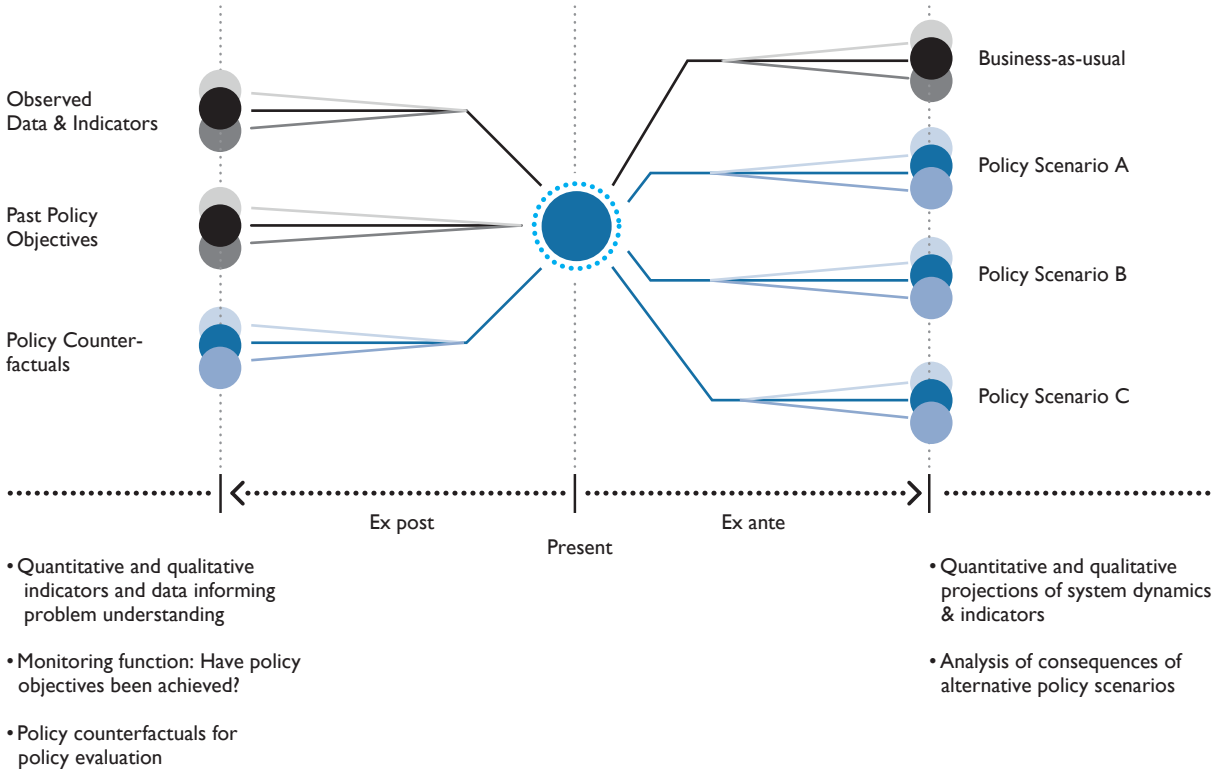

Figure 6: *Conceptual illustration of policy assessment as ex post and ex ante mapping of policy lessons and future decision alternatives. Dashed lines symbolize the need to consider uncertainties in the assessment of policy pathways.*

The increasing significance and high-stakes of environmental policy-making, together with the inherent divergent viewpoints that result from different perceptions, interests and value-sets, will inevitably lead to some degree of politicization and heightened tension within solution-oriented GEAs. Some observers suggest therefore abstaining from engaging in solution-oriented analysis in GEAs altogether. However, abandoning solution-oriented analysis will forgo the potential benefit of providing a fair and transparent account of the likely implications of different public policy positions; which in turn could facilitate and catalyse more constructive discourses and social learning processes, even across conflicting stakeholder groups. An integrated analysis of alternative perspectives within GEAs might seek to establish consensus in terms of "agreeing to disagree" on strongly competing positions. This might involve systematic inclusion of stakeholders within GEA processes that inter alia represent conflicting interest groups to better understand and possible resolve divergent viewpoints. Alternative future policy pathways suggested by different actor groups could be consistently analysed in view of their expected impacts on the policy objectives and interests that are important from the points of view of various relevant actor groups. Public policy objectives that could be considered are those currently deliberated in the emerging set of Sustainable Development Goals (SDGs). These relate to the provision of basic material income, food, health services, access to clean energy, water, reducing inequality, and other societal objectives, including sustainable consumption and production.

In both *ex post* and *ex ante* policy assessment, uncertainties and lack of knowledge over data, theories, models etc. need to be systematically considered in methodologies employed. The dashed lines in Figure 6 symbolize this need for living up to the state of the art of uncertainty treatment in GEAs exemplified e.g. in the multi-model and multi-scenario assessments of the IPCC, or the UNEP Gap Report. There is clearly a challenge in improving GEAs' conceptual capacities for dealing with uncertainties. Among promising approaches are risk management frameworks that are directly geared towards the decision-support needs of policymakers and societies that invariably need to act under conditions of uncertainty.

5. Strategic investments to enhancing policy assessment capacities

It seems worthwhile and strategic to invest in expanding the capacities of solution-oriented GEAs for effectively responding to the challenges of complexity and lack of research, in the mid- to long-run. Such investments should include building relevant Communities of Practices (CoPs), as well as research agendas (including in the relevant social sciences and humanities) in parallel to formal GEA processes. These efforts should be geared towards developing methodologies and empirical knowledge, which can better inform and support the needs of future GEAs.

Partly owing to the inherent complexity of environmental governance, for several policy domains, high-quality research is currently not readily available. As such, there is value in addressing existing knowledge deficits by empowering and engaging appropriate institutions, research networks and scientific partnership. New online Communities of Practice (CoP) could contribute to extending this knowledge base—including enhanced policy assessment methodologies—by building collaborative relationships and communal resources. GEA processes can contribute to such capacity building by identifying gaps in knowledge, leveraging existing partnerships, networks and centres of excellence to engage a broader range of experts, and by leveraging innovative digital platforms that can efficiently organize and convene such CoPs (i.e., UNEP Live).

Beyond the GEA enterprise, public and private research funding agencies have an important role to play in funding research that caters to the needs of GEAs, and could be approached by GEA stakeholders to ensure these organizations recognize this potential. Also, enhancing the incentives and rewards for contributing to GEAs, and conducting research that caters to their needs (e.g. in the evaluation criteria of universities and research institutes) could enhance the engagement of individual researchers. These incentives could also entice larger institutions to orient their existing work towards the specific knowledge needs of GEAs.

Conclusions

A major objective of earlier iterations of GEO was to provide a comprehensive overview of the state of the global environment, considering all relevant environmental sectors both at the global and regional level, and to consider potential policy options. In view of the challenges and response options facing contemporary GEAs, one major question arising in formulating the specific objectives of GEO-6 is whether it could benefit from narrowing its scope and ambition. Three overarching questions can guide related considerations: To which policy discourses (including target audiences) and specific policy questions could GEO-6 respond to? How would this translate into a formal operating mandate providing adequate and well-defined scope, objectives and target audiences? Which resources (including methodologies, frameworks and procedures, expertise, time, funds) are required to meet these objectives, and can they be mobilized for GEO-6?

Three options for the orientation of GEO-6 help illustrate related considerations: First, if GEO-6 would aim at retaining its broad scope in terms of addressing all relevant environmental sectors both at the global and regional level, the scope of this exercise might be narrowed by focusing on systematically assembling historical data on environmental indicators (and deliberately not to engage in comprehensive *ex post* policy assessment). Such an exercise might also assemble *ex ante* projections for these indicators (e.g. generated in related assessment exercises, such as scenarios over future emissions or global warming indicators analysed in the IPCC). UNEP-Live offers an innovative platform and unique opportunity for integrating, managing and communicating this type of knowledge efficiently. In addition, building on the pioneering analysis of GEO-5, *ex post* analysis of progress made on policy targets related to these indicators as agreed in multilateral environmental agreements and conventions could be systematically reviewed. This would contribute to global and sub-global policy discourses by responding to the policy question "are we on track to meeting policy objectives", thereby providing a monitoring function that can guide policy attention towards instances where the answer to the question is "no". Such an exercise could also be closely aligned to the emerging discourse over SDGs and post-2015 development agenda. Again, UNEP-Live could be leveraged as a platform harness appropriate data flows and synthesizing such knowledge. Adopting this approach might imply the need for reducing (or even eliminating) the scope e.g. of policy assessment elements in GEO-6, to focus resources and maximize the quality of such an indicator-oriented exercise. Alternatively, sufficient overall resources need to be provided to enable the same level of quality in pursuing a broader scope. While this might fundamentally alter the character of the GEO relative to earlier iterations, such change in orientation might pay off in terms of enhancing the impacts of the assessment on policy discourses. In terms of required means for such an approach, it would need to strongly involve national and sub-regional stakeholders that retain data on relevant indicators, and to assemble technical expertise as well as policy-oriented expertise on the use of indicators in policymaking.

A second, and alternative, option for refining the mandate for GEO-6 could be to focus on the role of policies, the environment and its inter-linkages with the economy and other social systems in providing basic human services such as health, food and other basic goods (for example, those specified in the emerging set of SDGs). Such an approach could explore alternative future policy pathways to meeting these goals. This would involve a substantive re-orientation of GEO away from offering a comprehensive view of the state of the global environment, and responding more directly to policy discourses related to the provision of these basic goods. Related expertise would need to be carefully assembled to enable integration of knowledge from multiple domains (including e.g. natural, social, and political sciences).

Finally, a third option for GEO-6 might be to attempt building a global policy database that would aim at providing policymakers and society a broad repository of options that promise to successfully tackle environmental challenges. However, such an exercise would need to carefully specify and restrict its scope, as the collation of information on all environmental policies existing worldwide would be highly resource intensive and clearly exceeds the capacity of any existing GEA process. Also, without careful assessment of *ex post* analyses and specific lessons learned for each specific instruments, and consideration of how these lessons can translate into policy

recommendations in other governance contexts, the practical value of such a database will remain very limited. If adopted, one key criterion for selecting the scope of such an exercise should be the availability of reliable literature providing and analysing case studies on policies that lend themselves to review in a GEA. Also, sufficient expertise in the establishment of such databases – posing novel methodological challenges to policy research – would need to be involved, and sufficient time would have to be granted. Overall, in view of the current state of the available environmental policy assessment literature, attempts to create comprehensive global policy databases including multi-dimensional and high-quality data of environmental policies across all dimensions of the domain of global environmental governance seem unrealistic. Experiences gained in GEO-5, suggest that such an ambitious approach, while attractive in principle, would require more strategic and long-term preparation to be successful, including the development of methodologies, CoPs and research programs that produce the necessary knowledge for utilization in future GEAs.

[1] In 1975 the OECD led the first comprehensive GEA process to deliver the *Assessment of Long-Range Transport of Air Pollutants: Measurements and Findings*; this two-year endeavour, the first of its kind, was the product of extensive co-operation between international scientists, laboratories and research institutions across 11 participating countries.

[2] For example see Mitchell et al., 2006; Rothman et al., 2009; Watson, 2013

[3] GEA Harvard Project

[4] The FOGEAM project (Future of Global Environmental Assessment Making) commenced in 2013 and is a joint research initiative by the MCC (Mercator Research Institute on Global Commons and Climate Change) and UNEP. The MCC is an independent academic research institute established in 2012 and located in Berlin (www.mcc-berlin.net). The research in FOGEAM aims at learning from past GEAs to inform the design and conduct of future GEAs. It employs multiple empirical methods, including 81 interviews with various stakeholders in the GEO-5 process and other GEAs including the IPCC AR5 (avg. interview duration 55 minutes); compilation and analyses of a GEA metadata catalogue comprising of information on 20 large-scale assessments; analysis of GEA background documents; and several expert workshops. The empirical analysis is complemented by literature review and synthesis as well as own conceptual argumentation. A preliminary draft report on the work in progress conducted under the FOGEAM project is available at the UNEP Live GEO-6 Community of Practice website.

[5] Grieneisen and Zhang, 2011

[6] These include the 1985 Ozone Assessment, the 1995 Global Biodiversity Assessment, the 2008 International Assessment of Agricultural Science, Technology for Development, and the 2012 Fifth Global Environment Outlook.

[7] Nature 2013, Hulme 2010, and several interviewees