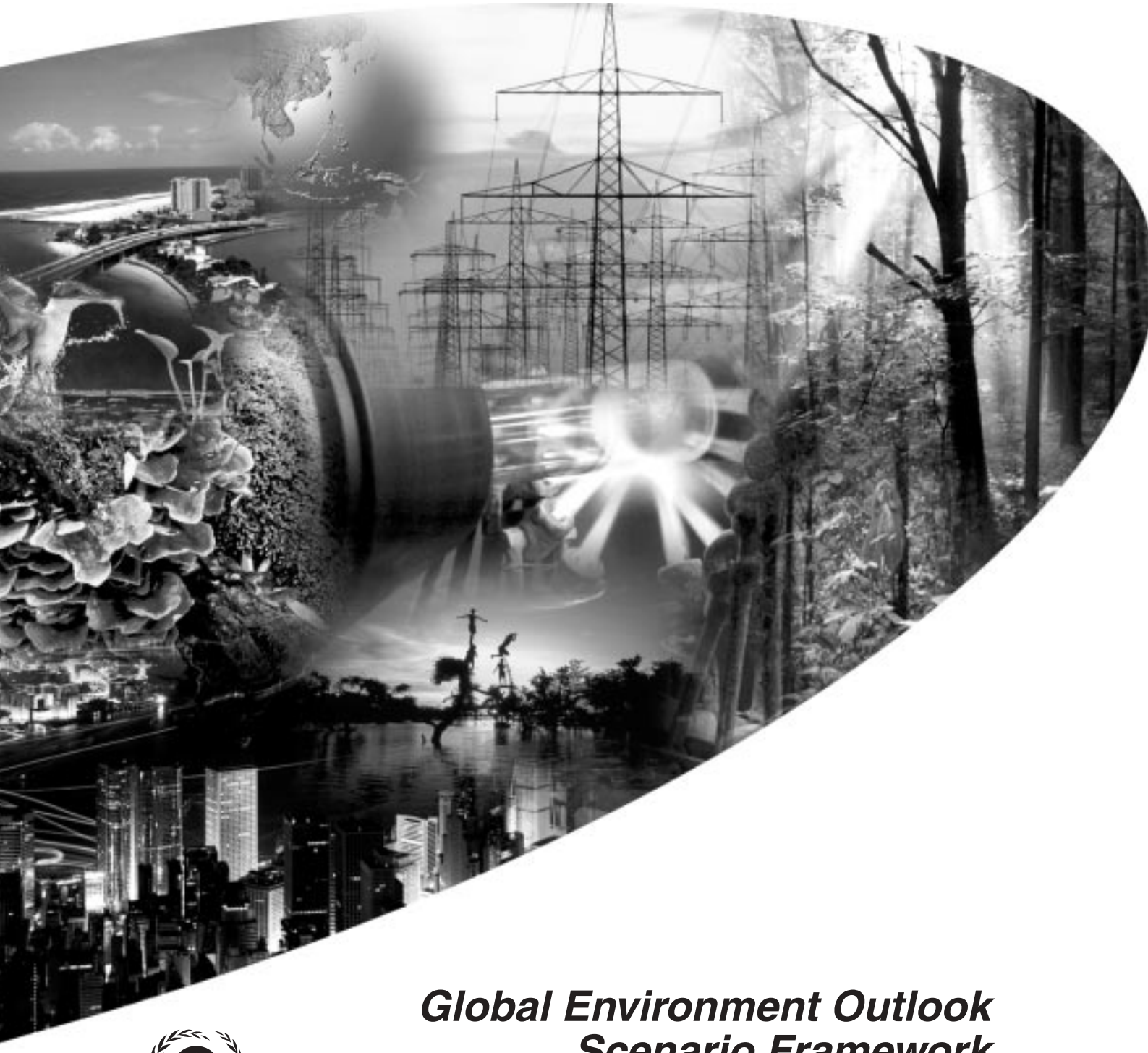

Global Environment Outlook Scenario Framework

Background Paper for UNEP's Third Global Environment Outlook Report (GEO-3)

UNEP

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1 GEO-3 and Scenarios

UNEP's Global Environment Outlook series provides a comprehensive assessment of the state of the global environment, a review of policy responses and an outlook on the future. The first Global Environment Outlook (GEO-1) was released in 1997, the second (GEO-2000) in 2000, and the third (GEO-3) in 2002. The *Looking to the Future* chapter of GEO-1 and the *Outlook* chapter of GEO-2000 used a scenario-based approach to illuminate the challenges and appropriate responses over the coming decades. Recognition of the important role of scenarios for scanning long-range prospects and synthesising global and regional perspectives goes back to the very beginning of the GEO series.[1]

The Outlook chapter of GEO-3 is ground-breaking in several ways. It goes beyond the earlier reports in assessing long-range global and regional environmental prospects in a coherent and comprehensive scenario framework. It is the result of an intensive two-year process, which included expert and collaborative meetings on global futures and regional scenarios, with the active participation of UNEP's collaborating centres throughout. It addresses environmental trends in an integrated framework that includes economic, social and cultural factors that ultimately shape the ways in which human activity impacts on nature. It places regional analyses in the context of global patterns, on the grounds that greater global interconnectedness links regional and global outlooks.

Earlier drafts of this paper served as discussion documents for the GEO-3 Outlook chapter meetings, and as a primary source for the chapter itself. Successive revisions captured the evolving consensus on the scenario descriptions and quantifications. In particular, the feedback from the various regional meetings provided the basis for further refinement of the global scenarios.

Section 2 of this paper introduces the scenario approach. Section 3 provides an overview of the major literature on scenario frameworks for structuring thinking about the future, and introduces a framework for GEO-3. Section 4 offers narratives for the GEO-3 scenarios and presents quantitative illustrations by region. Section 5 summarises some of the main lessons of the scenarios. Annex 1 presents statistical summaries of two of the scenarios for each region.

[1] At that time, the Stockholm Environment Conference Institute convened the Global Scenario Group (GSG), with participants from a wide spectrum of regions and disciplines. The GSG served as the Scenario Working Group for both GEO-1 and GEO-2000, and remained a key source for GEO-3. The presentation here draws heavily on previous GSG studies (Gallopin and others, 1997; Raskin and others, 1998; Raskin and others, 2002).

2 The Scenario Approach

GEO's mandate to assess long-term environmental issues poses significant methodological challenges. As the time horizon expands from years to decades, conventional techniques, such as trend analysis and mathematical modelling, become inadequate.

The long-term future cannot be extrapolated or predicted because of three types of indeterminacy – ignorance, surprise and volition:

- *Ignorance:* insufficient information on the current state of the system and the forces governing its dynamics lead to a classical statistical dispersion over possible future states.

- *Surprise:* even if precise information were available, complex systems are known to exhibit turbulent behaviour, extreme sensitivity to initial conditions and branching behaviours at various thresholds – the possibilities for novelty, surprise and emergent phenomena make accurate prediction impossible.

- *Volition:* the future is unknowable because it is subject to human choices that have not yet been made.

In the face of such indeterminacy, scenarios offer a means for examining the forces that shape our world, the uncertainties that lie before us and the implications for tomorrow of our actions today. A scenario is a story, told in words and numbers, concerning the manner in which future events could unfold; analysis of a range of scenarios offers lessons on how to direct the flow of events towards sustainable pathways and away from unsustainable ones. While we cannot know what will be, we can tell plausible and interesting stories about what could be.

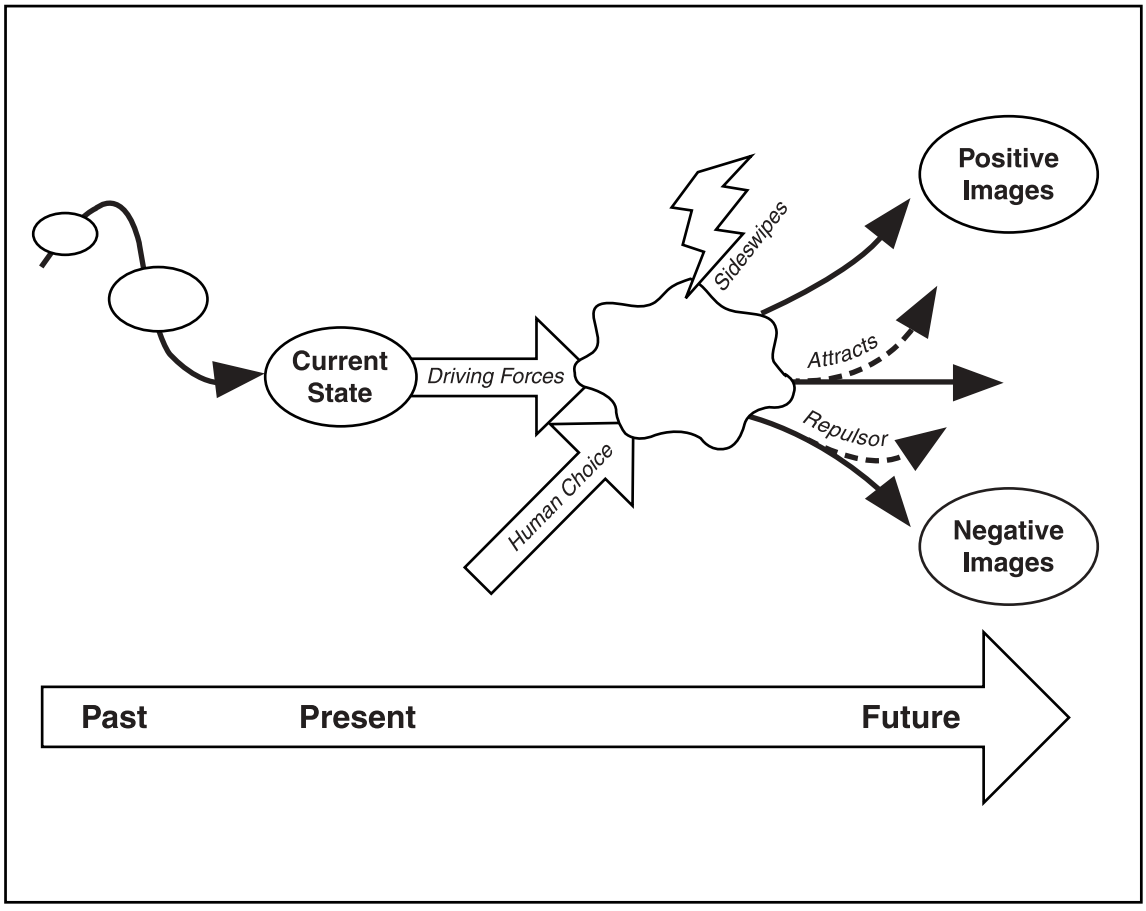
In the theatre, a scenario is a summary of a play. Analogously, development scenarios are stories about the future, each with a logical plot and narrative. Scenarios usually include images of the future – snapshots of the major features of interest at various points in time – and an account of the flow of events leading to such future conditions. Compelling scenarios need to be constructed with rigour, detail and creativity, and evaluated against the criteria of plausibility, self-consistency and sustainability, a process that requires thorough and intensive analysis.

Scenarios draw on science – our understanding of historical patterns, current conditions, and physical and social processes – and on the imagination to conceive, articulate and evaluate alternative pathways of development and the environment. In so doing, scenarios can illuminate the links between issues, the relationships between global and regional development, and the role of human actions in shaping the future. It is this added insight, leading to more informed and

rational action, that is the foremost goal of scenarios, rather than prediction of the future.

Figure 1 sketches the major features that govern the dynamics of change of combined human and environmental systems. The *current state* of the system is the outcome of an historical process. This state changes as a result of a set of *driving forces* which condition, but do not determine, the future trajectory of the system. The capacity of human beings to imagine alternative futures and act intentionally means that images of the future can act as *attractive* and *repulsive forces* in shaping a scenario. Positive images of future states might include their consistency with sustainability principles. Negative images can also play an important role, in raising awareness and guiding efforts to redirect the evolution of the system away from perilous conditions. In addition, surprising and extreme occurrences – called *sideswipes* in the figure – could affect development. Many unexpected events could have dramatic effects (e.g., a breakdown of the climate system, a world war, cheap fusion power, a major natural disaster, a rampant global epidemic), but probabilities cannot be assigned, nor can all the possibilities be imagined. From a sustainable development perspective, scenarios that minimise the vulnerability of societal and environmental systems to unfavourable events and enhance their resilience would be encouraged.

Figure 1. Scenario Dynamics



Scenario formulation generally involves the following steps:

- the *boundary* of the analysis is specified in several senses – spatially (e.g., global, regional, sub-regional), thematically (e.g., coverage of sectors, issues), and temporally (the time horizon of the analysis);
- the *current state* is described across a range of dimensions – economic, demographic, environmental, institutional and so on;
- the important *driving forces and trends* that are currently conditioning and changing the system are introduced;
- a *narrative*, or story line, provides the plot by which the scenario stories unfold (quantitative indicators are often used to illuminate aspects of the scenarios);
- an *image of the future* paints a picture of conditions at one or more points in time.

Some scenarios are 'forecasts', which describe how alternative futures might develop from current conditions and driving forces. Others are 'backcasts,' which begin with an image of the future and seek to identify plausible development pathways for getting there. The *Policy Reform* scenario, introduced in Section 3, is an example of a backcast.

The remainder of this section discusses the forces driving the GEO-3 scenarios at the global level. Regarding the other steps in formulating the scenarios, the temporal, spatial and thematic boundaries were set before the scenario development began. The GEO-3 Outlook chapter contains a thirty-year prospective, from 2002 to 2032, to balance the thirty-year retrospective in Chapter 2. Scenarios are developed for six global regions, with additional detail at the level of 21 sub-regions (see Annex). The environmental aspects of the scenarios focus on the eight GEO-3 themes: *Atmosphere, Land, Forests, Coastal and Marine, Biodiversity, Urban Areas, Natural Disasters, and Environment and Human Health.* The current state has been the focus of previous GEO reports and is taken up again in Chapter 2 of GEO-3. Finally, the global narratives and images of the future are the focus of Section 4.

Regarding driving forces, a number of significant trends and influences affect the initial direction of the global socio-ecological system and set the context for regional development. Major driving forces at the global level include:

Demographics