GEO5
Global Environment Outlook

Environment for the future we want

United Nations Environment Programme
Environment for the future we want
Acknowledgements

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Global Environment Outlook 5

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Anyone wishing to understand the pace and scale of environmental change will find UNEP’s flagship assessment report – *Global Environment Outlook-5: Environment for the future we want* – compelling reading. Equally, anyone seeking a paradigm shift that can bring us closer to a truly sustainable world will find this latest edition of the GEO series rich in opportunities and policy options.

**GEO-5** is designed to be the most comprehensive, impartial and in-depth assessment of its kind. It reflects the collective body of recent scientific knowledge, drawing on the work of leading experts, partner institutions and the vast body of research undertaken within and beyond the United Nations system.

The launch of **GEO-5** coincides with the final stages of preparation for the UN Conference on Sustainable Development (Rio+20), taking place two decades after the Rio Earth Summit that set the agenda for contemporary thinking about sustainable development. The report underlines the reasons why world leaders need to show decisive leadership in Rio and beyond. It highlights the state, trends and trajectories of the planet and its people, and showcases more than 100 initiatives, projects and policies from across the globe that are pioneering positive environmental change.

In a world with a growing population, glaring inequality and a precarious environmental base, it is imperative that Governments collaborate to balance the economic, social and environmental strands of sustainable development. **GEO-5** highlights not just the perils of delaying action, but the options that exist to transform sustainable development from theory to reality. I commend **GEO-5** to all who wish to invest in this generational opportunity to create the future we want.

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**Foreword**

BAN Ki-moon
Secretary General of the United Nations
United Nations Headquarters, New York

May 2012
Since the days of the ancient Egyptians, Greeks and Chinese, through the Islamic Golden Age and the Renaissance, philosophers and scientists have sought to make sense of the forces and processes of the natural world and humanity’s place within them. In the past half century or so, this endeavour has accelerated as concerns over the impacts of industrialization have emerged and more recently been fuelled by a growing realization that people – once marginal influencers of environmental change – are now its principal drivers, from biodiversity loss to climate change.

The *Global Environment Outlook: Environment for the future we want (GEO-5)* is part of this broad sweep of history, and is a major contribution to the public understanding of the way ecosystems and the atmosphere are responding to patterns of unprecedented consumption and production – patterns taking place on a planet of 7 billion people, rising to more than 9 billion by 2050. Its findings on the state of the planet, globally and regionally, are unsurprisingly sobering and cause for profound concern – they should serve as a reminder to world leaders and delegates attending the Rio+20 Summit in June as to why they are there.

Bridging the science-policy interface remains problematic – translating the findings of science into environmental law and policy making has been a challenge stretching back through Rio 1992 to the Stockholm Conference on the Human Environment of 1972. Encouragingly, a growing scientific understanding and technological progress have not fallen on deaf ears; they have inspired a myriad of treaties and agreements covering such issues as the trade in endangered species, the protection of the ozone layer, climate change, biodiversity loss and the banning of persistent organic pollutants.

GEO-5 adds new dimensions to the discourse through its assessment of progress towards meeting internationally agreed goals and identifying gaps in their achievement. Out of 90 goals and objectives assessed, significant progress could only be shown for four. Of equal concern, progress could not be appraised for 14 goals and objectives simply because data were lacking.

Another GEO-5 innovation is that it highlights a regional selection of more than a hundred policies and transformational actions that have been tried and tested successfully in countries and communities around the world. These policy options give decision makers tools that could be adapted to their own settings.

Such policy options are part of a broad sweep of emerging work termed the Green Economy, which in the context of sustainable development and poverty eradication is one of the two major themes for Rio+20. The summit is about taking stock and renewing commitments, but it is also about the integration of scientific findings in evidence-based policy making and the re-engagement of society in endeavours to move the world on to a sustainable path.

When nations take stock of sustainable development 20 years after the Rio Earth Summit of 1992, the limited achievements and endemic knowledge divide between North and South should be high on the agenda.

In summary, science must underpin policy making, but as five GEO assessments and reports have shown, it is not enough. Realizing and implementing science-based policies is where the real gap resides, and this can be bridged not by more satellite observations, field monitoring, computations and scenario modeling but by courage, decisiveness and political leadership that matches the reality that GEO-5 confirms.

Achim Steiner
United Nations Under-Secretary General and Executive Director
United Nations Environment Programme
Introduction

THE EARTH SYSTEM CONTEXT
The Earth System provides the basis for all human societies and their economic activities. People need clean air to breathe, safe water to drink, healthy food to eat, energy to produce and transport goods, and natural resources that provide the raw materials for all these services. However, the 7 billion humans alive today are collectively exploiting the Earth’s resources at accelerating rates and intensities that surpass the capacity of its systems to absorb wastes and neutralize the adverse effects on the environment. In fact, the depletion or degradation of several key resources has already constrained conventional development in some parts of the world.

Within the Earth System – which acts as a single, self-regulating system comprised of physical, chemical, biological and human components – the effects of human activities can be detected at a planetary scale (Chapter 7). These have led scientists to define a new geological epoch, the Anthropocene, based on evidence that atmospheric, geological, hydrological, biological and other Earth System processes are being altered by human activity. The most readily recognized changes include a rise in global temperatures and sea levels, and ocean acidification, all associated with the increase in emissions of greenhouse gases, especially carbon dioxide and methane (Chapters 2 and 4). Other human-induced changes include extensive deforestation and land clearance for agriculture and urbanization, causing species extinctions as natural habitats are destroyed (Chapters 3 and 5).

While humans have long been aware of the effects of their activities on the local environment, only in the last few decades has it become apparent that these activities can cumulatively affect the global environment (Chapters 1–7). In the past, anthropogenic pressures on natural resources were less pervasive and the Earth’s atmosphere, land and water could carry the load of human consumption and production. However, in the second half of the 20th century the effects of many diverse local changes compounded at accelerating rates to produce global consequences. Globalization allows goods to be produced under circumstances that consumers would refuse to tolerate in their own community, and permits waste to be exported out of sight, enabling people to ignore both its magnitude and its impacts. However, just as waste has – literally – reached the ends of the Earth, environmental concerns have become globalized as well (Chapter 1).

These threats to the Earth System have led the science community and policy makers to work together more closely to meet the challenge in a sustainable and collaborative manner.

THE SCIENCE-POLICY CONTEXT
At the 1972 United Nations Conference on the Human Environment, 119 nations came together for the first time to discuss serious environmental concerns raised by the scientific and conservation communities. As an initial step, the conference established UNEP to catalyse international and UN-wide environmental action. Twenty years on, the United Nations Conference on Environment and Development in Rio de Janeiro approved Agenda 21, a blueprint for the introduction of sustainable development, a concept first articulated as “satisfying the needs of the present generation without compromising the chance for future generations to satisfy theirs” in the World Commission on Environment and Development 1987 report Our Common Future. In the second decade of the new century, Agenda 21 remains a vibrant and relevant guide with many of its precepts yet to be applied, particularly in regard to consumption.

The 2000 Millennium Summit, which brought world leaders together to discuss the role of the United Nations at the turn of the 21st century, produced eight Millennium Development Goals (MDGs) to make up for shortcomings that resulted from a focus on economic objectives while international development stalled. The MDGs address the integration of sustainable development principles into country policies and programmes and aim to reverse the impoverishment of human and environmental resources, while setting time-bound targets and establishing metrics. MDG 7, which specifically addresses the environment, set targets to make significant reductions in the rate of biodiversity loss by 2010, to halve the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015, and to achieve a significant improvement in the lives of at least 100 million slum dwellers by 2020.

As understanding has developed about the relationship between human well-being and environmental change, so have the attempts to make it relevant for policy makers. The dependence of social development and economic activity on environmental services and stability is increasingly understood. An economy functions within a society, or within and between societies, using natural and human resources to produce marketable goods and services. At the same time, societies survive and thrive within the environment determined by the physical limits of atmosphere, land, water, biodiversity and other material resources.

Interacting environmental, social and economic forces produce a complex system that has been the focus of substantial research, but it is only in the last two decades that information and communication technologies have enabled researchers to model and explore the intricate complexities of the whole Earth System.

Insights gained from the ability to appreciate the power and nuance of Earth System complexities demand a new perception of the responsibilities and accountabilities of nation states towards planetary stewardship (Chapter 16 and 17). This not only requires the realization of environment and development
goals and targets but also the development of specific goals aimed at global sustainability, addressing the needs of the most vulnerable as well as the wants of the more powerful.

The elaboration of such goals requires scientifically credible indicators and information to guide, track and report progress (Chapter 8). Integrated environmental assessments are tools, within a broad and deep toolkit, that have been developed to meet this need. However, for the most part, policy developments and revisions have failed to adequately incorporate assessment findings and other scientific information into international policy priorities.

**BACKGROUND**

The main goal of UNEP’s *Global Environment Outlook* (GEO) is to keep governments and stakeholders informed of the state and trends of the global environment. Over the past 15 years, the GEO reports have examined a wealth of data, information and knowledge about the global environment; identified potential policy responses; and provided an outlook for the future. The assessments, and their consultative and collaborative processes, have worked to bridge the gap between science and policy by turning the best available scientific knowledge into information relevant for decision makers.

Previous GEO reports focused on an analysis of environmental issues and the identification of responses, using an integrated approach that provided a comprehensive and multidisciplinary overview across different themes. This fifth *Global Environment Outlook* (GEO-5) builds on previous reports, continuing to provide analyses of the state, trends and outlook for, and responses to, environmental change. But it also adds new dimensions through its assessment of progress towards meeting internationally agreed goals and identifying gaps in their achievement (Chapters 2–6), on analysing promising response options that have emerged in the regions (Chapters 9–15), and presenting potential responses for the international community (Chapters 16–17). Furthermore, for the first time, GEO-5 suggests that there should be a fundamental shift in the way environmental issues are analysed, with consideration given to the drivers of global change, rather than merely to the pressures on the environment.

Details of the process followed by the UNEP Secretariat in developing GEO-5, including the assemblage of more than 600 scientists guided by governmental, scientific and policy advisory bodies, are presented in the GEO-5 Process section.

**STRUCTURE**

The GEO-5 report is made up of 17 chapters organized into three distinct but linked parts.

**Part 1 – State and trends of the global environment**

To explore today’s rapidly changing socio-economic conditions, Chapter 1 examines the drivers of environmental change – the overarching socio-economic forces that exert varying degrees of influence, or pressures, on the environment. Chapter 1 identifies and describes these major root causes of the environmental challenges and provides some suggestions for policy interventions.

Using the drivers, pressures, state, impacts and responses (DPSIR) analytical framework (Figure 1), the GEO-5 assessment presents the latest state and trends of the global environment under the themes of atmosphere, land, water, biodiversity and, for the first time in the GEO series, chemicals and waste (Chapters 2–6).

The DPSIR framework is used to identify and evaluate the complex and multidimensional cause-and-effect relationships between society and the environment. The DPSIR framework used in GEO assessments is an extension of the pressure-state-response model developed by the OECD and the European Environment Agency in the mid-1990s. Drivers such as population dynamics, economic demand and unsustainable consumption and production patterns are processes that lead to impacts on the environment. These drivers often directly or indirectly result in environmental pressures including increased emissions of pollutants and wastes and destructive resource extraction. Such pressures cause changes to the environment with concomitant impacts on both humans and ecosystems. The DPSIR analytical framework helps to identify these processes. Finally, it suggests responses, which can take many forms at many scales from community action to international treaties, not only to the underlying drivers, but also to the environmental pressures and their impacts on ecosystems and human health.

Chapters 2–6 evaluate whether a selection of internationally agreed environmental goals are being met for each of the themes; Chapter 7 provides a synthesis of the thematic information from an Earth System perspective. Part 1 concludes with a review of the need to strengthen the collection, analysis and interpretation of data relevant to tracking the state and trends of the environment as a fundamental requirement for further research, for monitoring and evaluation, for scientific assessments, and for effective policy making (Chapter 8).

**Part 2 – Policy options from the regions**

Part 2 of GEO-5, Chapters 9–14, presents an appraisal of policy options from the regions (Figure 2) that show potential for helping to speed up the accomplishment of internationally agreed goals. This was requested by UNEP’s Governing Council and provides readers wishing to implement successful policies with promising avenues for exploration.

To direct the policy appraisal, multi-stakeholder consultations were undertaken in each region to identify priority environmental challenges and related internationally agreed goals.
Following a screening exercise, policies or policy clusters that either demonstrated a record of success with respect to their associated goals or featured innovative characteristics combined with promising initial results were retained and analysed in further detail. The policy appraisal was based on literature review, documented case studies and expert opinion. It was not always possible to apply a consistent appraisal methodology due to the multi-faceted and non-quantifiable elements of some of the internationally agreed goals and the multi-dimensional and cross-cutting nature of the co-benefits and trade-offs of the policies. Consistency of approach was also hampered by a lack of underlying data and indicators.

Figure 1 The GEO-5 DPSIR conceptual framework

The appraisal explored the benefits of the policies and the enabling conditions that facilitated their adoption or success. Other characteristics that were analysed include the monitoring and tracking of environmental, economic or social outcomes; cross-cutting effects on other priority themes and internationally agreed goals; and the potential for their application in new contexts.

Each region identified policy responses that were effective and potentially suitable for replication and/or adoption in other countries. Some highly promising approaches featured in the regional chapters are worthy of closer analysis and possible testing by governments.

The regional summary at the end of Part 2 (Chapter 15) presents an overview of the priority environmental challenges selected by the regions; a discussion on commonalities, challenges, and opportunities; and a summary of the policy options.

**Part 3 – Opportunities for a global response**

The final part of GEO-5 begins with an analysis of the type of actions required to reach a sustainable world. It first reviews existing environmental treaties and internationally agreed goals to construct a possible vision for 2050 with specific goals and targets. Next, existing scenario studies are reviewed in the context of two possible categories: conventional world scenarios that depict possible development if present trends continue and, second, global scenarios that aim to achieve a sustainable world. The analysis that follows identifies a range of measures that could enable the world to reach the sustainable development targets identified by GEO-5. Achieving these targets, however, requires radical departure from current trends. To account for the interactions of policies across sectors in the dense and interlinked system of global activities, an integrated sustainable world scenario is included in the analysis to examine the extent and complexity of policy changes needed to achieve the vision for 2050 (Chapter 16).

Chapters 16 and 17 review the state of knowledge of how public institutions, the private sector and civil society could generate effective and efficient responses to environmental change. While many responses at national and regional levels have successfully put societies on trajectories that are beginning to address some of these challenges, the analysis confirms that global environmental change cannot be addressed successfully by any single approach.

GEO-5 concludes by identifying action to undertake at the global level, combined with relevant national applications where appropriate, to enable the adoption of truly transformative policies – as well as the legal, institutional and policy frameworks required to make them successful. GEO-5 will provide the reader not only with an understanding of the complexity of the threats humanity faces, but possible policy solutions and transformative pathways to a sustainable future.

The GEO-5 process contributes to UNEP’s mission of providing leadership and encouraging partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. To facilitate its development the Earth was divided into regions which largely reflect the concerns and remits of the six UNEP’s Regional Offices, and allowed them to provide regional support to the working teams preparing GEO-5. A full breakdown of the regions, sub-regions and their respective nation states can be found on the Environmental Data Explorer (formerly the GEO Data Portal), at www.unep.org/geo/data.

**Figure 2 UNEP regions**
