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Summary Report on UNEP Foresight Process 2011 - 21 Issues for the 21st Century

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21 Issues for the 21st Century

Objectives

The purpose of the UNEP Foresight Process is to produce, every two years, a careful and authoritative ranking of the most important emerging issues related to the global environment. UNEP aims to inform the UN and wider international community about these issues on a timely basis, as well as provide input to its own work programme and that of other UN agencies.

Guidelines for 'emerging issues'

Since the concept of 'emerging issues' is subjective, it was not strictly defined so as not to limit the creativity of participants. It is used in the Foresight Process to describe issues that are recognized as very important by the scientific community, but are not yet receiving adequate attention from the policy community. Definitions of 'very important' and 'adequate' are left open to those identifying the issues: Emerging issues are further defined as those that are:

- Critical to the global environment. The issue can be either positive or negative but must be environmental in nature, or environmentally-related.
- Given priority over the next one to three years in the work programme of UNEP and, or, other UN institutions and, or, other international institutions concerned with the global environment.
- Have a large spatial scale. Issues should either be global, continental or 'universal' in nature (by 'universal' we mean an issue occurring in many places around the world).
- Recognized as 'emerging' based on newness,, which can be the result of: new scientific knowledge; new scales or accelerated rates of impact; and, or, new ways to respond to the issue.

The Foresight Process

The UNEP Foresight Process has been designed so as to encourage the creative thinking of participants and to be inclusive at the same time. At the core of the process is a Foresight Panel consisting of 22 distinguished members of the scientific community from 16 developing and industrialized countries (see appendix 2) and internationally recognized because of their expertise in one or more environmental and related issues.

Important steps in the process included:

- A canvass of ideas from the UNEP community to obtain a first list of emerging issues.
- Two facilitated meetings, during which the Foresight Panel expanded, debated and ranked the list of issues in a structured and systematic process. Some issues were combined and redefined, resulting in the selection of 21 priority issues.
- An extensive electronic consultation of scientists worldwide, in which more than 400 scientists provided feedback on the preliminary issues selected by the Panel during their first meeting.

The Issues: 21 Issues for the 21st Century

The output of the UNEP Foresight Process is a ranked list of 21 emerging issues. The issues relates to the major themes of the global environment, as well as important cross-cutting issues. The ranking of the issues is provided in Appendix 1.

Cross-cutting Issues

01. **Aligning Governance to the Challenges of Global Sustainability.** The current system of international environmental governance, with its maze of interlocking multilateral agreements, evolved during the 20th century, and is believed by many to be unsuitable for the 21st century. Some commentators believe that this system lacks the necessary representativeness, accountability and effectiveness for the transition to sustainability, and that a much higher level of participation and transparency is needed. New models of governance are being tested,, ranging from public-private-community partnerships to alliances of environmentalist and other civil society groups. However, the effectiveness of novel governance arrangements is unclear and requires further scrutiny.
02. **Transforming Human Capabilities for the 21st Century: Meeting Global Environmental Challenges and Moving Towards a Green Economy.** Adapting to global change and attaining a green economy will require a new variety of capabilities, in particular new job skills, modes of learning, management approaches and research efforts. Action is needed to fill the skills gaps in the green sector; update educational institutions to better meet educational needs for sustainability work; train managers to better respond to global environmental change; and encourage research to address the sustainability challenge.
03. **Broken Bridges: Reconnecting Science and Policy.** To cope with global environmental change, our society needs strategies and policies that are underpinned by a strong science and knowledge base. But many believe the linkage between the policy and science communities is inadequate or even deteriorating, and that this 'broken bridge' is hindering the development of solutions to global environmental change. This problem requires a new look at the way science is organized and how the science-policy interface can be improved.
04. **Social Tipping Points? Catalyzing Rapid and Transformative Changes in Human Behaviour towards the Environment.** New social science research has articulated the way in which damaging human behaviour can be transformed by public policy in a positive direction within a relatively short period of time. An example is the transformation of the public view of cigarette smoking from being a fashionable activity to being a dangerous health hazard within one generation in many countries. Can these insights also be applied to transforming habits of consumption that lead to destructive environmental changes? What public incentives – economic, informative, and prohibitive – would work best to achieve this transformation?
05. **New Concepts for Coping with Creeping Changes and Imminent Thresholds.** Many human interactions with the natural environment cause a slow, incremental and cumulative degradation of the environment; e.g., stratospheric ozone depletion, acid rain, air pollution, tropical deforestation, mangrove destruction, biodiversity loss, among others. Ironically, these 'creeping changes' are typically overlooked when they can be most easily addressed; they only become noticeable when their consequences appear, by which time they become more costly to mitigate. Hence effective early warning monitoring systems are needed to spot them early on so society can act on them.
06. **Coping with Migration Caused by New Aspects of Environmental Change.** A growing body of studies suggest that environmental change will become an increasingly decisive

factor in the displacement of people. These include both rapid-onset events, such as more frequent or intense coastal and river flooding, and slow-onset processes such as land degradation and sea level rise. Among the response options to environmental migration are: improving prediction of migration, incorporating plans for coping with migration into national adaptation plans, extending national and international immigration policies to include environmental migrants, and trying to mitigate the underlying causes of environmental migration such as vulnerability to flooding.

Food, Land and Biodiversity Issues

07. **New Challenges for Ensuring Food Safety and Food Security for the 9 Billion People**. Although food security is a longstanding issue, the world needs to confront a new set of challenges including an increasing population, climate change, competition for land from bioenergy production, heightened water scarcity, and possible shortfalls of phosphorus for fertilizer. Food safety also faces new challenges from increasing disease transmission from animals and food contamination. There is an urgent need to increase the security and safety of the world's food supply by setting up more comprehensive early warning systems, supporting smallholder farmers, reducing food waste, and increasing agricultural efficiency.

08. **Boosting Urban Sustainability and Resilience.** The issue of sustainability of cities has to do with both the environmental quality within cities that city residents have to live with, and the environmental changes caused by cities outside of their borders. Today neither aspect is particularly sustainable, especially in developing countries. The key to sustainability lies in the concept of "green cities" or "eco cities" which are different from conventional cities in that they are more compact, have a vital mix of land uses within their boundaries, provide many different low-energy transportation opportunities, and produce some of their own renewable energy. Such cities would provide their citizens with a high level of environmental quality and liveability, and have a lower environmental impact outside their boundaries.

09. **The New Rush for Land: Responding to New National and International Pressures.** Concerns over future energy and food supplies have led to a new rush for acquiring lands in developing countries by both foreign and national investors. Research shows that the rate of land acquisition has greatly accelerated over the past few years. There is a need for adequate understanding of the scale of the phenomenon, the main countries at risk, the positive trade-offs, and the implication for livelihoods, food security, ecosystem services, benefits, and conflicts. Putting safeguards in place, such as assessing the potential impacts of land deals before they are finalized, could minimize the drawbacks to the host country while allowing the investing countries to enhance their food and energy security.

010. **Beyond Conservation: Integrating Biodiversity across the Environmental and Economic Agendas**. In recent years, two important threads of research have documented how biodiversity is intertwined with other aspects of society and nature. One thread has articulated the linkages between biodiversity and other environmental issues (impact of climate change on ecosystems; interaction between ecosystems and the water cycle); and the other, the interrelationship between biodiversity and economics (valuation of ecosystem services; the role of biodiversity in underpinning economic activities). It is time to act on these new scientific insights and treat biodiversity as more than just a nature conversation issue. It is now time to fully integrate the issue of biodiversity into the global environmental and economic agendas.

Freshwaters and Marine Issues

011. **New Insights on Water-Land Interactions: Shift in the Management Paradigm.** Recent scientific research has provided a new view on how water and land interact locally to globally. For example, scientists now better understand the magnitude by which

changes in land use profoundly affect downwind rainfall patterns, and have computed the huge volumes of water appropriated (transpired or evaporated) by society to produce rainfed crops ('blue' versus 'green' water flows). This new knowledge provides a new impetus for bringing water and land management closer together. The result could be a boost in water productivity and higher food production per litre of water, as well as new ways of maintaining the quality of water.

012. Shortcutting the Degradation of Inland Waters in Developing Countries. Water quality degradation, channel modifications, and overfishing are some of the factors posing a growing threat to the freshwater ecosystems and inland fisheries of developing countries. But as developing countries stand on the brink of large-scale degradation of their inland waters, they have the option of shortcutting this degradation by taking advantage of forward-looking water technology and management techniques that were not available to countries in Europe and North America at the time they began contaminating their waterways.

013. Coastal Ecosystems: Addressing Increasing Pressures with Adaptive Governance. Increased pressure from the exploitation of coastal resources is significantly affecting coastal ecosystems. Settlements, industries, agriculture, fisheries and trade are concentrated in coastal zones; hence sensitive and highly valuable coastal ecosystems are subjected to on-going degradation. Present management approaches are inadequate for halting the tide of degradation. Therefore, an adaptive governance approach is needed that involves the delegation of management, rights, and power in such a way that the participation of all stakeholders is encouraged.

014. Potential Collapse of Oceanic Systems Requires Integrated Ocean Governance. Oceans provide many earth system functions including the regulation of weather, climate and the hydrological cycle, as well as providing habitat for a rich diversity of organisms, and food, materials and energy for human use. But the oceanic environment is faced with increasing threats to its long-term integrity, including: acidification, overfishing, land and marine-based pollution, widespread habitat destruction, and the proliferation of invasive species. There is a growing presumption that the current approach to managing oceans will be unable to prevent a collapse of some oceanic systems. This is because, among other reasons, responsible bodies are dispersed across UN agencies. Reforms are needed and new forms of governance should be considered and evaluated, including the option of establishing a new coordinating body for international ocean governance.

Climate Change Issues

015. New Challenges for Climate Change Mitigation and Adaptation: Managing the Unintended Consequences. When scaled up, mitigation and adaptation measures may have unintended consequences. For example, large scale wind farms may disrupt the migratory behaviour of birds; new massive sea walls will protect the populations but may also eliminate valuable natural wetlands; and large scale geoengineering schemes could have many unintended impacts. These potential negative side effects should be assessed, and then minimized or avoided, so that support for climate policies is not undermined.

016. Acting on the Signal of Climate Change in the Changing Frequency of Extreme Events. A spate of new scientific studies have compared climate modelling results against observational evidence and confirmed the hypothesis that climate change could alter the frequency, strength and distribution of extreme events. For example, studies have linked global warming with increased risk of flooding in England and Wales; increased summer rainfall variability in the Southeast United States; and the intensification of heavy precipitation events over much of the land area of the Northern Hemisphere. These new findings underscore the urgency for adapting to a changing frequency of extreme events, and suggest that 'medium term' early warning systems may be possible.

017. The Impacts of Glacier Retreat. Recent research shows that many glaciers are in retreat and some have an accelerating rate of melting. These changes pose threats to many, especially in the Himalayas, Central Asia and South American Andes. Threats include the risk of flooding from the bursting of dams holding back glacial lakes, as well as the eventual decline of dry season runoff in some regions. A much better understanding of the hydrological consequences and economic and social impacts of glacier retreat is needed, while the development of adaptation strategies is equally urgent.

Energy, Technology, and Waste Issues

018. Accelerating the Implementation of Environmentally-Friendly Renewable Energy Systems. As the world seeks solutions to climate change, it looks increasingly towards implementing renewable energy systems. But regardless of the large potential for renewable energy worldwide, this potential has not been realized due to many barriers. An important task is to identify the means to remove the economic, regulatory and institutional disadvantages that make renewable energy less competitive than other conventional sources.

019. Greater Risk than Necessary? The Need for a New Approach to Minimizing Risks of Novel Technologies and Chemicals. We are fixed in a pattern by which society first produces new technologies and chemicals and then *ex post facto* tries to evaluate the impacts of what it has produced. The latest examples are the questions raised by applications of synthetic biology and nanotechnology. With the accelerated pace by which novel technologies and chemicals are being deployed, a new approach should be considered by which their implications are systematically and comprehensively assessed *before* they reach the production phase with the aim to minimize their risks to society and nature. While this is happening in some parts of the world for some technologies and chemicals, it needs to become a universal approach and this may require new forms of international governance.

020. Changing the Face of Waste: Solving the Impending Scarcity of Strategic Minerals and Avoiding Electronic Waste. Increased demand for high-tech and renewable energy equipment is contributing to a depletion in strategic minerals, including rare earth metals. This is compounded by planned obsolescence and other wasteful manufacturing habits. The increased exploitation of minerals is also causing greater waste management problems, in particular, the build-up of electronic wastes (e-wastes). A promising option is to maximize the recovery of metals and other materials from electronic and other waste streams. This will slow down the extraction and depletion of minerals, reduce the quantity of their wastes, and thereby lessen their associated environmental and other impacts.

021. The Environmental Consequences of Decommissioning Nuclear Reactors. Many of the world's nuclear reactors are aging and will need to be decommissioned very soon. This is of concern because decommissioning is a major operation which produces large amounts of radioactive waste that need to be disposed of safely. There is an inadequate number of trained professionals to handle these operations even though the number of plants needing decommissioning will at least double within the next 10 years. The Fukushima nuclear accident in March 2011 has further accelerated plans to close nuclear plants, with some countries now accelerating the pace for shutting down their plants. International interventions, procedures, policies and cooperation are needed to minimize the potential danger posed by decommissioning activities to society and the environment.

Appendix 1

UNEP Foresight Process 2011
Final Ranking of Emerging Environmental Issues

	Issue Title	Ranking*
	Cross-cutting issues	
01	Aligning Governance to the Challenges of Global Sustainability	1
02	Transforming Human Capabilities for the 21st Century: Meeting Global Environmental Challenges and Moving Towards a Green Economy	2
03	Broken Bridges: Reconnecting Science and Policy	4
04	Social Tipping Points? Catalyzing Rapid and Transformative Changes in Human Behaviour towards the Environment	5
05	New Concepts for Coping with Creeping Changes and Imminent Thresholds	18
06	Coping with Migration Caused by New Aspects of Environmental Change	20
	Food, land, and biodiversity issues	
07	New Challenges for Ensuring Food Safety and Food Security for the 9 Billion People	3
08	Boosting Urban Sustainability and Resilience	11
09	The New Rush for Land: Responding to New National and International Pressures	12
10	Beyond Conservation: Integrating Biodiversity Across the Environmental and Economic Agendas	7
	Freshwater and marine issues	
11	New Insights on Water-Land Interactions: Shift in the Management Paradigm	6
12	Shortcutting the Degradation of Inland Waters in Developing Countries	15
13	Coastal Ecosystems: Addressing Increasing Pressures with Adaptive Governance	19
14	Potential Collapse of Oceanic Systems Requires Integrated Ocean Governance	13
	Climate change issues	
15	New Challenges for Climate Change Mitigation and Adaptation: Managing the Unintended Consequences	7
16	Acting on the Signal of Climate Change in the Changing Frequency of Extreme Events	16
17	The Impacts of Glacier Retreat	21
	Energy, technology, and wastes issues	
18	Accelerating the Implementation of Environmentally-Friendly Renewable Energy Systems	7
19	Greater Risk than Necessary? The Need for a New Approach to Minimizing Risks of Novel Technologies and Chemicals	10
20	Changing the Face of Waste: Solving the Impending Scarcity of Strategic Minerals and Avoiding Electronic Waste	14
21	The Environmental Consequences of Decommissioning Nuclear Reactors	17

** Ranking based on scoring of UNEP Foresight Panel at the end of the Foresight Process and after considering polling results of more than 400 scientists worldwide.*

Appendix 2

Members of UNEP Foresight Panel 2011

1	**Prof. John Agard** Professor Department of Life Sciences Faculty of Science and Agriculture The University of The West Indies St. Augustine Campus, Trinidad And Tobago	**8**	**Dr. Thelma Krug** INPE - Instituto Nacional de Pesquisas Espciais National Institute for Space Research Av. Dos Astrinautas 1758 Jardim da Granja SJ Campos 12227-010, Brazil
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3	**Prof. Frank Biermann** Professor and Head, Department of Environmental Policy Analysis Director-General, Netherlands Research School for Socio-economic and Natural Sciences of the Environment VU University Amsterdam, The Netherlands	**10**	**Dr. Isabelle Niang** Département de Géologie, Université Cheikh Anta Diop Dakar, Senegal
4	**Prof. Malin Falkenmark** Stockholm Water Institute Senior Scientific Advisor Stockholm International Water Institute Drottninggatan 33 SE - 111 51 Stockholm, Sweden	**11**	**Dr. Shuzo Nishioka** Project Leader of "Japan Low Carbon Society Scenarios toward 2050", National Institute for Environmental Studies 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506 Japan
5	**Professor Carl Folke** Stockholm Univ. Scientific Director and Theme leader Stockholm Resilience Center	**12**	**Professor Oladele Osibanjo** Executive Director Basel Convention Coordinating Centre For Training & Technology Transfer for the African Region, Director, Federal Ministry of Environment - University of Ibadan, Nigeria
6	**Dr. Michael H. Glantz** Director Consortium for Capacity Building (CCB) INSTAAR, University of Colorado	**13**	**Ms Cristelle Pratt** Independent Environmental Service Professional, Sustainable Island Innovations Former Director, SOPAC
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