



## ISDR Working Group 3: Risk, Vulnerability and Impact Assessment

### Summary Review of Selected Regional and Global Indexes: Disaster Risk Reduction and Sustainable Development

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## ***Disaster Risk Reduction***

### **Identification of Global Natural Disaster Hotspots**

The Hotspots project is being jointly implemented by the Center for Hazards and Risk Research (CHRR) at Columbia University, The World Bank, and a number of collaborating partner institutions as an activity of the Prevention Consortium, with funding from the UK Department for International Development (DFID). CHRR participants included researchers from the Lamont Doherty Earth Observatory (LDEO), the Center for International Earth Science Information Network (CIESIN), the International Research Institute for Climate Protection (IRI), and other centers within the Earth Institute of Columbia University. This project represents an effort to deepen understanding of the risks posed by multiple natural hazards and the potential for mitigation and response approaches that take into account the interactions among different hazards and hazard vulnerabilities. The first component of the analysis is a first-order global natural disaster risk assessment. Risks of human and economic losses will be estimated through spatial analysis by assessing the exposure of a global set of element at risk – people, infrastructure and economic activities – to all major natural hazards – droughts, floods, storms, earthquakes, volcanoes and landslides. The analysis will be based on the actual geographic distributions of these phenomena rather than on national-level statistics. Risks of losses among the elements at risk posed by each hazard individually will be aggregated across varying time scales to arrive at the aggregate, multi-hazard risk.

A series of case studies will be undertaken as the second component of the Hotspots project to complement the global-scale analysis. The case studies will use the same theory of disaster causality as the global analysis – that the risks of a specified type of disaster-related loss to a set of elements at risk over a given time period is a function of the exposure of the specified set of elements to natural hazards and their degree of vulnerability to the hazards to which they are exposed.

The project terms of reference call for assessment of risks of two types of outcomes, social and economic. The current profile of the project scientists and collaborators, however, is weighted towards physical factors on the one hand and towards disasters and risk generally on the other, with relatively limited expertise in the economic aspects of disasters. During a two-and-a-half day meeting at the Lamont Doherty Earth Observatory (LDEO) of Columbia University, the Earth Institute and World Bank agreed to jointly review a set of case studies on the economic impacts of disasters and to decide how to incorporate economic considerations into the project. The resulting approach will be incorporated into the project workplan.

**For more information regarding the hotspots project please visit the following web sites:**

<http://doherty.lidgo.columbia.edu/CHRR/Hotspot/hotspotmain.html>

<http://www.proventionconsortium.org/files/hotspots2002/dilley.pdf>

## **HAZUS**

As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, the Federal Emergency Management Agency (FEMA) in the United States aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is HAZUS or Hazards U.S., a natural hazard loss estimation methodology developed by FEMA under contract with the National Institute of Building Sciences.

Using Geographic Information Systems (GIS) technology, HAZUS allows users to compute estimates of damage and losses that could result from an earthquake. To support FEMA's mitigation and emergency preparedness efforts, HAZUS is being expanded into HAZUS-MH , a multi-hazard methodology with new modules for estimating potential losses from wind and flood (riverine and coastal) hazards.

### **Earthquake Model**

Earthquake loss estimates are forecasts of damage and loss to buildings, infrastructure, and populations that may result from potential earthquakes. Loss estimates produced by HAZUS are based on current scientific and engineering knowledge of the effects of earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation policy, emergency preparedness, and response and recovery planning.

HAZUS uses geographic information system software to calculate, map and display earthquake hazards and damage at three levels of complexity. Level 1 analysis uses national data sets that are included with HAZUS. Level 2 analysis allows the user to modify the national data sets with local data for more refined and site specific results. Finally, Level 3 analysis allows users to supply their own techniques to study special conditions such as dam break and tsunami. Engineering and other special expertise is needed at this level.

## Hurricane Loss Estimation

The hazard component of the HAZUS hurricane model will make use of an existing state-of-the-art windfield model, developed by Applied Research Associates, which has been calibrated and validated using full-scale hurricane data. The model incorporates sea surface temperature in the boundary layer analysis, and calculates wind speed as a function of central pressure, translation speed, and surface roughness. The HAZUS wind model will be an improvement over existing loss estimation models by using a wind hazard-load-damage-loss framework. The model will address wind pressure, wind borne debris, surge and waves, atmospheric pressure change, duration/fatigue, and rain.

## Flood Model

The HAZUS Flood Model is being developed for release in early 2003. The model will be capable of assessing riverine and coastal flooding. It will estimate potential damages to all classes of buildings, essential facilities, transportation and utility lifelines, and agricultural areas. The model will estimate debris, shelter and casualties. Direct losses will be estimated based on physical damage to structure, contents, and building interiors. The effects of flood warning and velocity will be taken into account.

The flood model will use geographic information system software to map and display flood hazard data, and the results of damage and loss estimates for building and infrastructure. It will also enable users to estimate the effects of flooding on populations.

The flood model will operate at Level 1, utilizing existing national building inventory and hazard data, and at Level 2 with site-specific, user-supplied data for more refined results. Level 3 analysis will allow users to supply their own techniques to analyze special conditions and to improve the national data sets.

**For additional information regarding HAZUS please visit the following web sites:** <http://www.nibs.org/hazusweb/> and <http://www.fema.gov/hazus/index.shtm>

## **Tyndall Climate Change/Disaster Risk Index**

The UK based Tyndall Centre for Climate Change Research uses data relating to natural disasters for the assessment of recent historical and current risk associated with climatic variability. Several proxies of risk and vulnerability are developed from the available data and discussed in terms of the meaning and implications of risk proxies. The numbers of people killed and otherwise affected by discrete climate-related natural disasters over the final decades of the twentieth century may be as a proxy for climatic risk. It is recognized that natural disasters result from the interaction of hazard and vulnerability. In the case of climate related disasters, hazard represents the likelihood of occurrence, and potential severity of social, economic, political and physical factors that determine

the amount of damage a given event will cause. The countries at greatest risk from present climate-related disasters are nearly all developing countries with many of them showing a high degree of consistency in their rankings over the time periods (1971-1980, 1981-1990, 1991-2000) examined. Current risk associated with extreme climate events is therefore a reasonable proxy for risk associated with climate change in the future. Countries that are unable to cope with current climate hazards will be the most poorly equipped to cope with the adverse impacts of climate change; any increase in the frequency or severity of extreme climate events is likely to exacerbate their vulnerability.

The data used are derived from the Emergency Events Database (EM-DAT) developed by the US Office of Foreign Disaster Assistance (OFDA) and the Centre for Research into the Epidemiology of Disasters (CRED) at the Université Catholique de Louvain in Belgium (<http://www.cred.be/emdat>) as well as population data from the World Bank. The EM-DAT dataset and its processing, take into account the reliability of the data in terms of coverage, representation of trends, recording practices and attribution of particular disasters to climate related events. Finally, the results of the risk study are examined and commented on, within the context of considerations of vulnerability. This is only a first step in assessing risk. Once high-risk countries have been identified it is necessary to examine the vulnerability of different population groups at a sub-national scale in order to target resources for capacity building; adaptation funds will be useless if they are not employed in a process driven fashion that takes into account the particular geographical, political, economic and social circumstance so the vulnerable groups in question. Furthermore, a country may have a low risk score, but contain highly vulnerable population groups that are not representative of the national population as a whole. Conclusions that particular countries are especially at risk therefore do not indicate that risk or vulnerability is concentrated exclusively in those countries.

EM-DAT data nominally cover all countries over the entire twentieth century. However, data are sparse for many countries and regions prior to about 1970. The database contains entries under a number of different categories for individual natural disasters (a version including technological disasters is also available). Along with entries describing the type of disaster, its date and location, are entries for numbers killed, injured, made homeless and otherwise affected (i.e. Otherwise requiring immediate assistance). There is also an entry for "total affected", including those injured, made homeless and otherwise affected. Other categories describe economic damage in US Dollars, Euros and local currency, value on appropriate disaster scale, data sources, whether there was an OFDA response, and general comments. An event qualifies for inclusion in EM-DAT if it is associated with 10 or more people reported killed, 100 or more people affected, a call for international assistance, or the declaration of a state of emergency.

**For more information regarding the Tyndall Climate Change/Disaster Risk Index please visit the following web site:**

[http://www.tyndall.ac.uk/publications/working\\_papers/working\\_papers.shtml](http://www.tyndall.ac.uk/publications/working_papers/working_papers.shtml)

## ***Disaster Risk Reduction / Environmental Management***

### **Environmental Vulnerabilities Index**

A vulnerability index for the natural environment, the basis of all human welfare, has been developed and is undergoing testing at the South Pacific Applied Geoscience Commission (SOPAC). The Environmental Vulnerability Index (EVI) is among the first tools now being developed to focus environmental management at the same scales that environmentally-significant decisions are made, and focus them on outcomes. It is a method that uses 54 *smart indicators* to assess the vulnerability of the environment at the scale of entire countries. This is an appropriate scale because it is the one at which major decisions affecting the environment in terms of policies, economics and social and cultural behaviors are made. If environmental conditions are monitored at the same times as those concerning human systems, there is better opportunity for feedback between them. Without exception, the environment is the life-support system of all human systems and is an integral part of the development and success of countries.

The EVI is an indicator-based method for estimating the vulnerability of the environment of a country to future shocks. It is reported simultaneously as a single dimensionless index and as a profile showing the results for each indicator. This means that in addition to an overall signal of vulnerability, the EVI can be used to identify specific problems. It has been designed to reflect the status of a country's environmental vulnerability, which refers to the extent to which the natural environment is prone to damage and degradation. It does not address the vulnerability of the social, cultural, or economic environment, nor the environment that has become dominated by these same human systems (i.e. Cities, farms). The natural environment, then, includes those biophysical systems that can be sustained without direct and / or continuing human support. In the context of the EVI, "damage" refers to the loss of diversity, extent, quality and function of ecosystems.

A total of 54 indicators has been selected through extensive consultation with experts working in the major human and natural sciences. The measure selected are here being termed "smart indicators" and can be defined as those which capture a large number of elements in a complex interactive system while showing how the value obtained relates to some ideal or agreed-upon condition. That is, central to the concept of smart is the idea that "good" and "bad" performance is inherent in the way that the indicator is expressed. A high

vulnerability value of 7 indicates high risk or vulnerability to ecological damage, while a score of 1 indicates that for this measure, risks or vulnerability are low.

Twenty-eight of the indicators are classed as part of the Risk Exposure sub-index (REI) and relate to expected risks of hazards occurring in the future. Eighteen of the indicators form the EDI, or extrinsic resilience sub-index, and relate to damage already sustained, and that is expected to compromise the ability of ecosystems to cope with future hazards. The remaining 8 indicators are classed as measurers of intrinsic resilience (IRI), inherent features of the country that make it more or less vulnerable to environmental damage. Independently of whether an indicator is classed as a measure of risk of intrinsic or extrinsic resilience, it is also categorised according to whether it is meteorological, geological, biological or anthropogenic in origin or nature. There are 6 meteorological, 5 geological, 11 biological and 25 anthropological indicators spread amongst the REI and EDI sub-indices. In general, risk exposure measures tend to be meteorological, geological or biological in nature, while extrinsic resilience measures tend to be anthropogenic. IRI measures are categorised separately, with most of the intrinsic characters of a country being either geomorphological or biogeographical in nature. Humans are explicitly incorporated as indicators in the EVI. Around 50% of the indicators are direct measures of human choices and behaviour in relation to environmental vulnerability.

**For more information regarding the EVI please visit the following web site:**  
<http://www.sopac.org>

### **Small Islands Developing States Index**

The Small Islands Developing States Index represents an important collaborative effort coordinated by the UN Commission for Sustainable Development (CSD: Small Islands). In April 1994, the first global conference on sustainable development and the implementation of Agenda 21 -the Global Conference on the Sustainable Development of Small Island Developing States was convened in Barbados. The conference highlighted the economic and ecological vulnerabilities of small island developing States (SIDS) and, through the adoption of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States, it set forth specific policies, actions and measures to be taken at the national, regional and international levels in support of the sustainable development of SIDS.

Paragraphs 113 and 114 of the Programme of Action for the Sustainable Development of Small Island Developing States which was endorsed by the General Assembly in 1994 by resolution 49/122 call for the development of a vulnerability index (indices) for small island developing States (SIDS).

Accordingly, the UN Department of Economic and Social Affairs undertook initial studies in 1996 in order to provide a conceptual framework for the development of a vulnerability index. An expert group meeting took place at which it was agreed that vulnerability indices are meant to reflect relative economic and ecological susceptibility to exogenous shocks, in other words, the risk of a country being affected by such shocks. The vulnerability index is designed to identify which group of countries exceed a threshold of vulnerability at which they are particularly susceptible to risks and warrant special attention from agencies providing assistance. At the same time the index and its components are intended to provide a multi-dimensional approach to the identification of programmes designed to reduce individual countries' exposure to exogenous factors that may affect their development. The group concurred that vulnerability indices should be simple to build and based on indicators which are easy to comprehend and intuitively meaningful; and suitable for inter-country comparisons or reflecting relative vulnerability of countries, SIDS and non-SIDS.

The expert group examined the conceptual relevance and feasibility of a number of indicators in reflecting structural economic and ecological vulnerability of countries. Regarding ecological vulnerability, the group agreed that indices should reflect the relative susceptibility of economies to damage by natural disasters and relative susceptibility of the ecology of countries to damage by anthropogenic activities or exogenous factors, the former to reflect economic vulnerability induced by the environment, the latter to reflect ecological vulnerability.

On the basis of the available data, the expert group examined the impact of natural disasters on a number of economic indicators. The group concluded that it would be useful and feasible to consider the frequency of occurrence of natural disasters weighted by the percentage of the population affected.

While the group recognized that an index of "Human and Economic Loss due to Natural Disasters" had been recommended to the United Nations Commission on Sustainable Development (August 1996), it felt that such a broad index had not yet reached the stage of being operationally feasible. The group suggested that efforts should continue to undertake systematic assessments of the economic impact of natural disasters which could eventually be used for this purpose.

Concerning other components of an economic vulnerability index, exposure to trade shocks was extensively discussed. It was agreed that openness to trade (or any indicator based on trade/GDP ratio) should not be considered per se as an indicator of vulnerability, but that it could be considered as a weighting factor for measuring the exposure to risk incurred by a country. The risk could be proxied by a concentration coefficient of exports of goods and services, and then possibly weighted or multiplied by an export/GDP ratio. The indicator could be, for instance, the ratio of the three leading exports of goods and services to GDP taken as an average for a number years. This indicator could be complemented

by an index of instability of the exports of goods and services. Remittances could be added to the value of goods and services.

**For additional information regarding the Small Island Developing States index, please visit the following web site:**

<http://www.un.org/esa/sustdev/aboutsids.htm>

## ***Environmental Management / Sustainable Development***

### **Bellagio Principles: Guidelines for the Practical Assessment of Progress Toward Sustainable Development**

In 1987, the World Commission on Environment and Development (Brundtland Commission) called for the development of new ways to measure and assess progress toward sustainable development. This call has been subsequently echoed in Agenda 21 of the 1992 Earth Summit and through activities that range from local to global in scale. In response, significant efforts to assess performance have been made by corporations, non-government organizations, academics, communities, nations, and international organizations.

In November 1996, an international group of measurement practitioners and researchers from five continents came together at the Rockefeller Foundation's Study and Conference Center in Bellagio, Italy to review progress to date and to synthesize insights from practical ongoing efforts. The above mentioned principles resulted and were unanimously endorsed.

The Bellagio principles serve as guidelines for the whole of the assessment process including the choice and design of indicators, their interpretation and communication of result. They should be applied as a complete set. They are intended for use in starting and improving assessment activities of community groups, non-governmental organizations, corporations, national governments, and international institutions.

These principles deal with four aspects of assessing progress toward sustainability. Principle 1 deals with the starting point of any assessment by establishing a vision of sustainable development and clear goals that provide a practical definition of that vision in terms that are meaningful for the decision-making unit in question. Principles 2 through 5 deal with the content of any assessment and the need to merge a sense of the overall system with a practical focus on current priority issues. Principles 6 through 8 deal with key issues of the process of assessment, while Principles 9 and 10 deal with the necessity for establishing a continuing capacity for assessment.

**For additional information please visit the following web site:**

<http://iisd.ca/measure/bellagio1.htm>

## **Millennium Ecosystem Assessment:**

The Millennium Ecosystem Assessment is a large and ambitious effort supported by UN agencies, International Financial Institutions, international research and academic organizations, national governments and private foundations. An integrated ecosystem assessment is an analysis of the capacity of an ecosystem to provide goods and services important for human development. The capacity of ecosystems to produce goods and services ranging from food to clean water is fundamentally important for meeting human needs and ultimately influences the development prospects of nations. And when that capacity is diminished, the most serious toll is exacted on the poor, who often depend directly on forests, fisheries, and agriculture and who tend to be most vulnerable to the environmental problems that result from ecosystem degradation such as floods or crop failures. But while policymakers have ready access to information on the condition of their nation's economy, educational programs, or health care system, comparable information on the condition of ecosystems is unavailable despite the important role that they play. In fact, no nation or global institution has ever undertaken a comprehensive assessment of how well ecosystems are doing in meeting human needs.

An integrated ecosystem assessment includes both ecological and economic analysis and it considers both the current state of the ecosystem and its future potential. Because the geographic boundaries of an ecosystem are arbitrary, an ecosystem assessment could be conducted at a single site, for a region, or globally. Two fundamental features of an ecosystem assessment are:

- The assessment is place-based. The fundamental unit of interest is the ecosystem itself—a biological system and its associated physical environment in a particular location, recognizing that the factors influencing that system may be either local (e.g., farming) or remote (e.g., change in atmospheric CO<sub>2</sub>). This site-specific or "spatial" information can then be aggregated to analyze regional or global trends and processes.
- The assessment is multi-sectoral. An ecosystem assessment is designed to provide information on how a suite of factors interact to influence the ecosystem and how an entire array of goods and services are affected by changes in the ecosystem. In contrast, a sectoral assessment focuses on a single product or function of an ecosystem, such as timber, agriculture, or biodiversity, or a single factor influencing the system, such as invasive species or climate change.

It is enormously challenging to measure the overall "condition" of an ecosystem. Unlike a living organism, which might be either healthy or unhealthy but can't be both simultaneously, ecosystems can be in good condition for producing certain goods and services while in poor condition for others. Ecosystem goods include products such as food, timber, genetic resources, and medicines, and services encompass water purification, flood control, coastline stabilization, carbon sequestration, waste treatment, biodiversity conservation, soil generation,

disease regulation, pollination, maintenance of air quality, and the provision of aesthetic and cultural benefits

Instead, a more useful approach to evaluating the condition of an ecosystem is to assess separately the capacity of the system to provide each of the various goods and services and then to evaluate the trade-offs among those goods and services. For example, consider just two services-food production and water filtration. An analysis of a particular region might reveal that food production is in very good shape, but because of the loss of forests and heavy application of fertilizers the ability of the system to provide clean water has been diminished. The ecosystem is in good condition for food production, but in poor shape for the production of clean water. Even if that trade-off is a conscious one, it remains to be seen whether the capacity of the system to provide the combination of the services is optimized. For example, it may turn out that the addition of a rotation of a green manure crop could greatly reduce nutrient inputs, dramatically increase water quality, and have little negative effect on agricultural yield. Thus, the ecosystem was not being managed to optimize the combination of food and clean water than might have been achieved through an alternative management approach.

This approach to ecosystem assessments is called an "integrated assessment" because it examines not just a single ecosystem product, such as crop production, but an entire array of products that the ecosystem might provide. The principal benefit of an integrated ecosystem assessment is that it provides a framework for examining the interlinkages and trade-offs among various goods and services. The opportunity to increase the aggregate benefits from the bundle of goods and services produced by an ecosystem would be hidden in an assessment of each sector in isolation.

**For more information regarding the Millennium Ecosystem Assessment please visit the following web site:**

<http://www.millenniumassessment.org/en/about/index.htm>

### **Environmental Sustainability Index**

Piloted at the start of the millennium, as an initiative of the Global Leaders for Tomorrow Environmental Task Force, World Economic Forum, the Environmental Sustainability Index (ESI) works towards the development of a measure of overall progress towards global environmental sustainability. This important and ambitious initiative is a collaborative activity of the World Economic Forum's Global Leaders for Tomorrow Environment Task Force, the Yale Center for Environmental Law and Policy, and the Columbia University Center for International Earth Science Information Network with ongoing support from the Samuel Family Foundation. The prototype pilot ESI, launched in January 2000, set forth to stimulate a debate and dialogue over what constitutes environmental sustainability, how to measure the concept, what data are needed and where

they can be found (or developed), what should count as performance, how to weight different components of sustainability, what methodology should be pursued in constructing an index, and what policy choices drive sustainability. The ESI is the most comprehensive quantitative global report on the state of the environment. Created to satisfy a critical need for substantive, impartial data for environmental decision making , it presents concrete ways to scientifically examine sustainability at a global level, and sets forth baseline information on which progress can be benchmarked. Currently incorporating data for 142 countries, the 2002 Environmental Sustainability Index, scores are based upon a set of 20 core “indicators”, each of which combines two to eight variables for a total of 68 underlying variables. The ESI tracks relative success for each country in the five core components of environmental systems; reducing stresses; reducing human vulnerability; social and institutional capacity; and global stewardship. It’s novel approach permits cross-national comparisons of environmental sustainability in a systematic and quantitative fashion and facilitates a more analytically rigorous and data driven approach to environmental decision making.

Communications about the ESI may be directed to:

[ciesin.info@ciesin.columbia.edu](mailto:ciesin.info@ciesin.columbia.edu)

**For more information please see the following websites:**

[www.weforum.org](http://www.weforum.org)

[www.ciesin.columbia.edu](http://www.ciesin.columbia.edu)

[www.yale.edu/envirocenter](http://www.yale.edu/envirocenter)

### **Pilot Environmental Performance Index**

The newly created pilot Environmental Performance Index (EPI), launched in 2002, builds on the previous work undertaken developing the ESI. The EPI initiative serves as a parallel effort with a related, yet distinctive, purpose. Similarly, both the ESI and EPI are direct responses to the wide gap observed between the expressed goals of national public authorities regarding environmental sustainability and their ability to benchmark and measure progress towards achieving those goals. The ESI and EPI differ in the following fundamental way. The ESI is aimed mainly at decision-makers and analysts who wish to compare nations’ anticipated longer term environmental paths. Covering a fairly broad set of indicators, the ESI utilizes current data to determine which countries are comparatively well suited to achieve lasting environmental sustainability and which are not. In contrast, the EPI permits national comparisons on recent efforts to manage a narrow set of common policy objectives concerning such elemental indicators as air and water quality, climate change (greenhouse gas emissions) and ecosystem well-being. Designed to

measure current environmental results at the national scale, the EPI is derived from a collection of data sets aggregated from these core indicators. These indicators provide measures of both current performance and rates of change. Providing a valuable counterpoint to the ESI, the specifically targeted and results-oriented EPI enables benchmarking of progress towards meeting immediate national policy objectives, facilitates judgments about environmental performance, and can be used to identify important differences in performance that may warrant intervention and investigation.

Communications about the EPI may be directed to:

[ciesin.info@ciesin.columbia.edu](mailto:ciesin.info@ciesin.columbia.edu)

**For more information please see the following websites:**

[www.weforum.org](http://www.weforum.org)

[www.ciesin.columbia.edu](http://www.ciesin.columbia.edu)

[www.yale.edu/envirocenter](http://www.yale.edu/envirocenter)

### **Sustainability Program Ecological Footprint Accounts**

The Sustainability Program Ecological Footprint Accounts was developed by a U.S.A. based organization, Redefining Progress (RP), a group of academics and development practitioners who work with a broad array of partners to shift the economy and institutions towards sustainability. The Ecological Footprint Accounts compute sustainability in specific and understandable terms by using the best available scientific data. They allow individuals, policy analysts, organizations, and environments to measure and communicate the economic, environmental, distributional and security impacts of natural resource use.

Ecological Footprint Accounts document humanity's demands on nature. A population's Ecological Footprint is the biologically productive area needed to produce the resources used and absorb the waste generated by that population. Official statistics track consumption and translate that into the amount of biologically productive land and water area required to produce the resources consumed and to assimilate the wastes generated using prevailing technology. Since people use resources from all over the world, the Ecological Footprint Accounts calculate the combined size of these areas-wherever they may be on the planet. Ecological Footprints (representing human demand) can be compared to the biological capacity (representing economical supply in a specific region of for the entire planet.

When human demands exceed ecological production the natural capital (assets on which current and future generations depend) declines. This situation is called "overshoot," or the global ecological deficit. Current calculations assess a nation's consumption in over 60 categories of resources by adding imports to,

and subtracting exports from, domestic production. Each category includes primary products (such as milk or timber) and the manufactured products derived from them. To put it in mathematical terms: *apparent consumption = production + imports - exports*. This balance is computed for 72 categories such as cereals, timber, fishmeal, coal, and cotton. These resource uses are translated into global acres by dividing the total amount consumed in each category by its ecological productivity (or yield). In the case of carbon dioxide (CO<sub>2</sub>) emissions, the total is divided by the assimilation capacity of forests.

Some of the resource and waste categories are primary resource uses (such as raw timber or milk), while others are manufactured products that are derived from the primary ones (such as paper or cheese). For example, if one ton of pork is exported, the amount of cereals and energy required to produce this ton of pork is translated into a corresponding biologically productive area and then subtracted from the exporting country's footprint. This amount is added to the importing country's Ecological Footprint.

Biomass yields, measured in dry weight, are taken from statistics from the United Nations Food and Agriculture Organization (FAO). In the case of sea space, the production of fish protein is directly compared to the animal protein production of grain-fed poultry. World-average space consequently has an equivalence factor and a yield factor of 1. Thus, the physical extensions of the global areas of biologically productive space and those areas adjusted with the equivalence and yield factors add up to the same global total. Every year has its own set of equivalence factors since land-use productivities change over time

**Ecological Footprint calculations are based on five assumptions:**

1. It is possible to keep track of most of the resources people consume and many of the wastes people generate. Much of that information can be found in existing official statistics.
2. Most of these resource and waste flows can be converted into the biologically productive area that is required to maintain these flows.
3. These different areas can be expressed in the same unit (hectares or acres) once they are scaled proportionally to their biomass productivity. In other words, each particular acre can be translated to an equivalent area of world-average land productivity.
4. Since these areas stand for mutually exclusive uses, and each standardized acre represents the same amount of biomass productivity, they can be added up to a total—a total representing humanity's demand.
5. This area for total human demand can be compared with nature's supply of ecological services, since it is also possible to assess the area on the planet that is biologically productive.

The world's Ecological Footprint changes in proportion to global population size, average consumption per person, and the resource intensity of the technology being used. Technology can alter the productivity of land, or the efficiency with which resources are used to produce goods and services. The footprint

calculations are conservative estimates of human impact since insufficient data are available on some uses of the biosphere. Also, the calculations assume that the technologies used in resource exploitation are the average of those prevailing in the world today, and do not make distinctions between the use of more sustainable exploitation in some places and less sustainable exploitation in others. This may distort the size of some countries' footprints, but does not affect the global result.

Resources use and waste emissions are expressed in global hectares (or acres) by calculating how much biologically productive space is required to provide these services using current technology.

The average world citizen has an Ecological Footprint of 2.3 global hectares (5.6 acres), the average German's is 4.7 global hectares (12 acres), and the average American's is 9.6 global hectares (24 acres).

**For more information regarding Ecological Footprints please visit the following web site:**

<http://www.redefiningprogress.org/programs/sustainability/ef/>

### **Dashboard of Sustainability Indicators**

The Dashboard of Sustainability, a new online tool that helps policy-makers and the public visualize and track progress towards sustainable development, was presented at the World Summit on Sustainable Development (WSSD) in Johannesburg.

The software communicates complex information in a user-friendly format, allowing people to see sustainability performance between countries, through the use of numerous indicators. The Dashboard of Sustainability was developed by the Consultative Group on Sustainable Development Indicators (CGSDI), a group of leading indicator experts from five continents. It is based on the United Nations CSD indicator set and contains 19 social, 20 environmental, 14 economic and eight institutional indicators. It includes data for over 200 countries. The latest version, RioJo, allows a comparison of the situation at the time of the Rio Summit in 1992 with the current state of the world.

The Dashboard is the product of a six-year international project led by the Canadian-based International Institute for Sustainable Development (IISD), with headquarters in Winnipeg, Manitoba.

"It provides a tool to signal what is significant and to go deeper into the underlying causes," says Peter Hardi, Director of Measurement and Indicators at the International Institute for Sustainable Development. "Like the instrumentation

of an aircraft, the Dashboard offers a visual signal of progress towards sustainable development, and warnings of problems."

"The Dashboard helps the 'pilots' of our societies to understand the complexity of sustainable development, and to discuss and communicate their ideas," adds Jochen Jesinghaus, a civil servant at the European Commission and author of the Dashboard software.

**For more information please visit the IISD home page: <http://www.iisd.org>**

## ***Sustainable Human Development***

### **The Human Development Index**

UNDP's Human Development Index (HDI) measures a country's achievements in three aspects of human development: longevity, knowledge, and a decent standard of living. Longevity is measured by life expectancy at birth; knowledge is measured by a combination of the adult literacy rate and the combined gross primary, secondary, and tertiary enrolment ratio; and standard of living, as measured by GDP per capita (PPP US\$).

The Human Development Index is used to capture the attention of policy makers, media and NGOs and to draw their attention away from the more usual economic statistics to focus instead on human outcomes, not economic data. The HDI was created to re-emphasize that people and their lives should be the ultimate criteria for assessing the development of a country, not economic growth. To question national policy choices - asking how two countries with the same level of income per person can end up with such different human development outcomes (HDI levels). For example, Viet Nam and Pakistan have similar levels of income per person, but life expectancy and literacy differ greatly between the two countries, with Viet Nam having a much higher HDI value than Pakistan. These striking contrasts immediately stimulate debate on government policies on health and education, asking why what is achieved in one country is far from the reach of another. The HDI can be used as well to highlight wide differences within countries, between provinces or states, across races, language or religious groupings. Highlighting internal disparities along these lines has raised national debate in many countries.

Although the HDI is a useful tool it is not enough to measure a country's level of development. The concept of human development is much broader than can be captured in the HDI, or any other of the indices (GDI, GEM and HPI). The HDI, for example, does not reflect political participation or gender inequalities. The HPI-2, measuring human poverty in the richest countries, shows surprising results. The United States, with the second highest GDP per capita, also has the highest extent of deprivations. The indices can only offer a broad proxy on the

issues of human development, gender, and human poverty. A fuller picture of a country's level of human development requires analysis of other human development indicators and information.

**For more information regarding the Human Development Index please visit the following web site: <http://hdr.undp.org>**

### **The Human Poverty Index**

Poverty has traditionally been measured as a lack of income - but this is far too narrow a definition. Human poverty is a concept that captures the many dimensions of poverty that exist in both poor and rich countries. UNDP's HPI-1 (Human Poverty Index for developing countries) measures deprivations in the same three aspects of human development as the HDI (longevity, life expectancy, and a decent standard of living). HPI-2 (Human Poverty Index for industrialized countries) includes, in addition to these dimensions, social exclusion. HPI-1(developing countries): deprivations in longevity are measured by the percentage of newborns not expected to survive to age 40. Deprivations in knowledge are measured by the percentage of adults who are illiterate. Deprivations in a decent standard of living are measured by two variables: the percentage of people not using improved water sources and the percentage of children below the age of five who are underweight. HPI-2 (industrialized countries): deprivations in longevity are measured by the percentage of newborns not expected to survive to age 60. Deprivations in knowledge are measured by the percentage of people who are functionally illiterate. Deprivations in a decent standard of living are measured by the percentage of people living below the income poverty line, set at 50% of the median disposable household income. Social exclusion is measured by the rate of long-term (12 months or more) unemployment of the labour force. (Note the HPI-2 is used for all OECD countries except the Czech Republic, Hungary, the Republic of Korea, Mexico, Poland, and Turkey.)

To focus attention on the most deprived people in a country, not on average national achievement. The Human Poverty Indices focus directly on the number of people living in deprivation - presenting a very different picture from average national achievement. It also moves the focus of poverty debates away from concern about income poverty alone. To highlight the presence of human poverty in every single country. High income per person is no guarantee of a poverty-free country. Even among the richest industrial countries, there is human poverty. The Human Poverty Index for industrial countries (HPI-2) shows that out of 17 European and North American countries, the US has the second highest level of income per person - but also the highest rate of human poverty. To guide national planning for poverty alleviation. Many National Human Development Reports now break down the HPI by district level or language group to identify the areas or social groups within the country most deprived in terms of human

poverty. The results can be dramatic, creating national debate and helping to reshape policies.

**For more information regarding the Human Poverty Index please visit the following web page: <http://hdr.undp.org/statistics/faq.cfm>**

### **Human Insecurity Index**

The Human Insecurity Index is a collaborative effort initiated by the Canadian based Global Environmental Change and Human Security (GECHS) project which is a core project of the International Human Dimensions Programme on Global Environmental Change (IHDP). The main goal of the GECHS project is to advance interdisciplinary, international research and policy efforts in the area of human security and environmental change. The GECHS project promotes collaborative and participatory research, and encourages new methodological approaches. The Index of Human Insecurity is essentially a classification system that distinguishes countries based on how vulnerable or insecure they are, and groups together those countries that possess similar levels of insecurity. We developed the framework for the selection of indicators for the IHI from our previous work on indicators of sustainable development, although parallels and congruencies with theoretical developments in other indicator research fields, such as human well-being and social indicators, are also evident. Indicator selection followed a set of evaluation criteria that included:

- relevance to the selection framework in that the indicator measures either key structural relationships (i.e., linkages and defining characteristics) or key functional relationships (i.e., process flows) of the system with reference to either environmental, economic, societal, or institutional components
- existence of a theoretical or empirical link between the indicator and insecurity (see below);
- general availability of the data;
- consistency of the data with other selected indicators to allow for future modeling of the system; and
- adequacy of the spatial coverage based on the number of countries represented and adequacy of the time series available.

Human security, by almost any definition, is a function of a complex set of characteristics and processes – social, political, environmental, and institutional. All of these components are necessary for security and for sustainability. Using the above evaluation criteria, it was decided to initially select four indicators corresponding to each of the four categories, thus yielding a standard set of 16 indicators. Changes in the levels of the individual indicators reflect potential changes in the levels of human insecurity.

In summary, the following steps were used to calculate the IHI.

1. A complete time series for all indicators and all countries was established. Data were collected, where available, for the years 1970 through 1995. As most countries did not have complete time series for most indicators, it was desirable to estimate missing time series data through some relatively simple statistical techniques (linear regression or data inter-polation) where the existing data was sufficient;
2. The data were standardized. Indicators were adjusted such that they use the same unitless scale and possess the same range of possible values such that all indicators are given the same weight in the composite index; and,
3. The data were classified and the index calculated. Data for each indicator were classified for each year into 10 categories by cluster analysis. Countries were assigned a number between one and ten for each indicator in which they had a known or estimated value. The corresponding IHI value was then calculated for each country in each year as the average category value for all indicators.

**For further information on the Human Insecurity Index please visit the following web site: [http://www.gechs.org/aviso/avisoenglish/six\\_lg.shtml](http://www.gechs.org/aviso/avisoenglish/six_lg.shtml)**

### **Freedom House Index:**

*Freedom in the World* is an institutional effort by Freedom House to monitor the progress and decline of political rights and civil liberties in 192 nations and in major related and disputed territories. The Survey is an evaluation of political rights and civil liberties in the world. The Survey assesses a country's freedom by examining its record in two areas: political rights and civil liberties. A country grants its citizens political rights when it permits them to form political parties that represent a significant range of voter choice and whose leaders can openly compete for and be elected to positions of power in government. A country upholds its citizens' civil liberties when it respects and protects their religious, ethnic, economic, linguistic, and other rights, including gender and family rights, personal freedoms, and freedoms of the press, belief, and association. The Survey rates each country on a seven-point scale for both political rights and civil liberties (1 representing the most free and 7 the least free) and then divides the world into three broad categories: "Free" (countries whose ratings average 1-3); "Partly Free" (countries whose ratings average 3-5.5); and "Not Free" (countries whose ratings average 5.57).

The ratings are not only assessments of the conduct of governments. Rather,

they are intended to reflect the reality of daily life. Thus a country with a benign government facing violent forces (for example terrorist movements or insurgencies) hostile to an open society will be graded on the basis of the on-the-ground conditions that determine whether the population is able to exercise its freedoms. The Survey enables scholars and policy makers both to assess the direction of global change annually and to examine trends in freedom over time and on a comparative basis across regions with different political and economic systems.

Since 1989, the Survey project has been a yearlong effort produced by our regional experts, consultants, and human rights specialists. The Survey derives its information from a wide range of sources. Most valued of these are the many human rights activists, journalists, editors and political figures around the world who keep us informed of the human rights situation in their countries.

#### Definitions and categories of the Survey:

The *Survey's* understanding of freedom encompasses two general sets of characteristics grouped under political rights and civil liberties. Political rights enable people to participate freely in the political process, which is the system by which the polity chooses authoritative policy makers and attempts to make binding decisions affecting the national, regional, or local community. In a free society, this represents the right of all adults to vote and compete for public office, and for elected representatives to have a decisive vote on public policies. Civil liberties include the freedoms to develop views, institutions, and personal autonomy apart from the state.

The *Survey* employs two series of checklists, one for questions regarding political rights and one for civil liberties, and assigns each country or territory considered a numerical rating for each category. The political rights and civil liberties ratings are then averaged and used to assign each country and territory to an overall status of "Free," "Partly Free," or "Not Free." (See the section below, "Rating System for Political Rights and Civil Liberties," for a detailed description of the *Survey's* methodology.)

Freedom House rates both independent countries and their territories. For the purposes of the *Survey*, countries are defined as internationally recognized independent states whose governments are resident within their officially claimed borders. In the case of Cyprus, two sets of ratings are provided, as there are two governments on that divided island. This does not imply that Freedom House endorses Cypriot division. It was noted that neither the predominantly Greek Republic of Cyprus, nor the Turkish-occupied, predominantly Turkish territory of the Republic of Northern Cyprus, is the de facto government for the entire island. This year, East Timor moved from the disputed territory to country category following the region's successful referendum on independence in August 1999. The referendum, which was widely recognized by the international community,

led to East Timor being placed under United Nations administration during its transition to full sovereignty.

Freedom House divides territories into two categories: related territories and disputed territories. Related territories consist mostly of colonies, protectorates, and island dependencies of sovereign states which are in some relation of dependency to that state and whose relationship is not currently in serious legal or political dispute. Puerto Rico, Hong Kong, and French Guyana are three examples of related territories. Since most related territories have a broad range of civil liberties and some form of self-government, a higher proportion of them have the "Free" designation than do independent countries. Disputed territories represent areas within internationally recognized sovereign states which are usually dominated by a minority ethnic group and whose status is in serious political or violent dispute. This group also includes territories whose incorporation into nation-states is not universally recognized. In some cases, the issue of dispute is the desire of the majority of the population of that territory to secede from the sovereign state and either form an independent country or become part of a neighboring state. Tibet, Kashmir, and Abkhazia are examples falling within this category.

Freedom House assigns only designations of "Free," "Partly Free," and "Not Free" for the eight related territories with populations under 5,000, designated as "microterritories," without corresponding category numbers. However, the same methodology is used to determine the status of these territories as for larger territories and independent states. The microterritories in the Survey are Cocos (Keeling) Islands, Rapanui (Easter Island), Falkland Islands, Niue, Norfolk Island, Pitcairn Islands, Svalbard, and Tokelau. The *Survey* excludes from its consideration uninhabited territories and such entities as the U.S.-owned Johnston Atoll, which has only a transient military population and no native inhabitants.

**For more information regarding the Freedom House index please visit the Freedom House home page: <http://www.freedomhouse.org>**

### **Transition Index:**

The Transition Report is a unique source of information on developments in central and eastern Europe and the Commonwealth of Independent States (CIS). Drawing on the European Bank for Reconstruction and Development's (EBRD) extensive experience as an investor in the region, the Report offers comprehensive analysis of the transition to market economies and macroeconomic performance.

Country-by-country assessments comprise macroeconomic tables, including output and expenditure and foreign direct investment. They also provide key data

on liberalisation, stabilisation, privatisation, enterprise reform, infrastructure, financial institutions and social reform.

One of the main goals of transition has been to transform the role of the state in the economy – to persuade it to adopt a form of governance based on support for markets and private enterprise rather than plans and commands. Yet despite the considerable achievements in liberalisation and privatisation in the first decade of transition, the quality of economic governance varies widely across the region, as revealed by the survey of over 3,000 enterprises in 20 countries – the Business Environment and Enterprise Performance Survey – which was undertaken for this Report. Surprisingly, this variation is not a direct result of the extent of economic reforms that have been adopted. In fact, enterprises in both the most advanced and least advanced countries tend to have relatively favourable assessments of the quality of their governance, while those in countries with partial reforms report a higher level of governance problems. A key to explaining different assessments of governance across the region lies in the extent to which the state is subject to "capture" – or undue influence – by vested interests. The survey provides a unique opportunity to measure and compare the extent of state capture across the region and to investigate its effects on the overall quality of governance.

The survey also shows that the initial hope that privatisation would create the foundation for improved governance and transform the ties between the state and firms has not been fully realised. The impact of privatisation on the quality of governance depends strongly on the extent of state capture. Firms in transition economies continue to interact with the state in a complex web of costs and benefits that differs across countries and types of firms. Enterprises spend considerable resources in lobbying state officials, paying bribes and adjusting to state interference. In return, they receive benefits in the form of subsidies, soft finance, tax advantages and the tolerance of arrears. A key challenge remains the effective "depoliticisation" of firms through further market reforms and measures to constrain state capture by private interests.

**For additional information please visit the European Bank for Reconstruction and Development home page: [www.ebrd.com](http://www.ebrd.com)**

### **Human Rights Indicators:**

The purpose of this study was to provide indicator sets, which can be used in human rights assessments or evaluative studies. It was designed mainly for the purposes of work in the Project Document of the Danish Centre of Human Rights.

The indicators measure the commitment of governments to respect and fulfil human rights, and in order to capture the distinct dimensions of how this is expressed, it was chosen to distinguish between two forms of commitment, “formal” and “real”. It is important to state that the outset is not that one is better or more important than the other, but that they merely reflect different stages, which are mutually inter-linked in the sense that establishing the legal foundations is not just an important step in itself, but also paves the way for increased respect and fulfillment measured through concrete government action in relation to the standards. Conversely, if the concrete action by the state or its agents can be described as being in conformity with the requirements of the human rights standards, it also makes ratification and implementation of the instruments easier and more likely.

Formal commitment of governments is measured in the ratification of international human rights laws and regional instruments, in constitutions and in reservations and regional instruments, in short the various instruments which make up the legal framework of human rights in a given context. In this case, commitment to respect and fulfill is seen as the willingness of states to submit themselves to be bound by legal instruments and to establish the norms and standards in the domestic legal context, as well as to accept the main institutions relating to individual complaints.

Real commitment of governments is measured by indexing actual violations by governments in the field of civil-political rights and by indexing levels of government conduct in the social sector, i.e., a proximate way of measuring commitment to economic, social, and cultural rights. Finally, government conduct in dealing with gender discriminations is measured partly by public sector employment of women and partly by adult female literacy rate. Gender discrimination is given a separate prominence partly because it relates to the human rights situation of half of the population, partly because the assessment of civil and political rights has shown that all states are discriminating in gender terms; the challenge is thus not to measure whether violations occur in this field or not, but to obtain some measure of the degree of violations.

Four factors are therefore part of the assessment of commitment:

1. An index measuring commitment to international and regional human rights standards by governments
2. An index of civil and political human rights violations by governments
3. An index approximating commitment to fulfillment of economic, social and cultural rights
4. An index measuring in a preliminary way commitment to gender equality by governments.

**For more information regarding the Human Rights Indicators please visit the Danish Centre for Human Rights home page:**

<http://www.humanrights.dk/departments/PP/PA/Concept/Indicato/>

### **Health in Sustainable Development Planning: the Role of Indicators**

Considerable work on the development of indicators has been done by many organizations, including the World Health Organization. This book builds on work done-to-date, and lays a basis for the further development and use of health and environmental indicators in sustainable development planning. It is aimed at professionals, policy and decision-makers in the fields of health, environment and development, especially those working at the interface of these issues, who are concerned with the development of indicators as well as with their application. The overall aim is to provide tools and guidance for indicator development and use, and to promote their application and use at all levels, local to global, and in respective sectors.

This book deals with the development and use of indicators for health and sustainable development planning. It addresses both technical as well as social aspects of indicator development and use. Elements of the planning process are outlined, and the application of indicators highlighted. Illustrative examples are given where appropriate, and an organizational framework is presented for addressing health-environment-development linkages.

The book has nine chapters which deal with the following topics: Issues in Health, Environment and Sustainable Development, The Nature and Use of Indicators, International Indicators Initiatives, Construction of Indicators, Intersectoral Planning for Health and Sustainable Development, Indicator Development and the Planning Cycle, Framework for Linkages between Health, Environment and Development and Issue-specific Indicators.

**For more information regarding Health in Sustainable Development Planning please see the following web site:**

<http://www.who.int/mediacentre/events/IndicatorsFrontpages.pdf>

### **AIDS Program Effort Index**

The AIDS Program Effort Index (API) is a joint effort of UNAIDS, USAID and the POLICY Project to measure the amount of effort put into national AIDS programs by both domestic and international organizations. The API was implemented in 40 countries in 2000.

UNAIDS, USAID and the POLICY Project have developed the AIDS Programme Effort Index (API) to measure programme effort in the response to the HIV/AIDS

epidemic. The index is designed to provide a profile that describes national effort and the international contribution to that effort. The API was applied to 40 countries in 2000. The results show that programme effort is relatively high in the areas of legal and regulatory environment, policy formulation and organizational structure. Political support was somewhat lower but increased the most from 1998. Monitoring and evaluation and prevention programmes scored in the middle range, about 50 out of 100 possible points. The lowest rated components were resources and care. The API also measured the availability of key prevention and care services. Overall, essential services are available to about half of the people living in urban areas but to only about one-quarter of the entire population. International efforts to assist country programmes received relatively high rating in all categories except care. The results presented will be supplemented later in 2001 with a new component on human rights.

The API is a composite indicator composed of a number of individual items grouped into key categories. *Knowledgeable* individuals score each item on a scale of 0-5. The item scores are averaged for each category to produce a category score that does not depend on the number of items in the category. The category scores form a profile describing the programme effort of each country. The API was implemented in each country by national consultants. These consultants were recommended by the UNAIDS Country Programme Advisor or Theme Group Chairperson. Consultants were independent of the national programme and UNAIDS but had good knowledge of the programme and the people involved. The national consultants selected 15-25 respondents from a variety of backgrounds, having a clear understanding and knowledge of their country's National AIDS Programme. Respondents were not meant to be a representative sample but were carefully selected for their knowledge and viewpoint.

**For more information regarding the API please visit the following web site:**  
[http://www.tfgi.com/Api\\_final.doc](http://www.tfgi.com/Api_final.doc)