2002 Environmental Sustainability Index

An Initiative of the Global Leaders of Tomorrow Environment Task Force, World Economic Forum

Annual Meeting 2002

In collaboration with:

Yale Center for Environmental Law and Policy
Yale University
Center for International Earth Science Information Network
Columbia University

Global Leaders for Tomorrow Environment Task Force

Chair:
Kim Samuel-Johnson
Canada

Project Director:
Daniel C. Esty
United States

Members:

Manny Amadi
United Kingdom

Francisco Gutierrez-Campos
Paraguay

John Manzoni
United Kingdom

Alicia Barcena Ibara
Chile

Guy Hands
United Kingdom

Liavan Mallin
United States

Ugar Bayar
Turkey

Molly Harriss-Olson
Australia

Jonathan Mills
Australia

Matthew Cadbury
United Kingdom

George M. Kailis
Australia

Rodrigo Navarro Banzer
Venezuela

Carlos E. Cisneros
Venezuela

Shiv Vikram Khemka
India

Patrick Odier
Switzerland

Craig A. Cohon
United Kingdom

Loren Legarda
The Philippines

Paul L. Saffo
United States

Colin Coleman
South Africa

Maria Leichner
Uruguay

Simon Tay
Singapore

Dominique-Henri Freiche
France

Christopher B. Leptos
Australia

Kiyomi Tsujimoto
Japan

Thomas Ganswindt
Germany

Philippa Malmgren
United States

Yale Center for Environmental Law and Policy (YCELP)

Daniel C. Esty
Director

Ilmi M.E. Granoff
Project Director

Barbara Ruth
Administrative Associate

Marguerite Camera
Report Coordinator

Center for International Earth Science Information Network (CIESIN), Columbia University

Marc Levy
Associate Director

Bob Chen
Deputy Director

Kobi Ako Abayomi
Statistician

Maarten Tromp
GIS Specialist

Alex de Sherbinin
Research Associate

Francesca Pozzi
Research Associate

Antoinette Wannebo
Research Associate

2002 Environmental Sustainability Index

An Initiative of the Global Leaders of Tomorrow Environment Task Force, World Economic Forum

Annual Meeting 2002

The 2002 Environmental Sustainability Index was made possible by the generous support of the Samuel Family Foundation. The World Economic Forum, the Yale Center for Environmental Law and Policy, and the Center for International Earth Science Information Network are grateful to the Samuel Family Foundation for its visionary commitment to advancing our ability to measure environmental sustainability.

Global Leaders for Tomorrow
World Economic Forum
91-93 route de la Capite
1223 Cologny/Geneva Switzerland
(41-22) 869-1212
Fax (41-22) 786-2744
contact@weforum.org
www.weforum.org

Center for International Earth Science Information Network
Columbia University
PO Box 1000 61 Route 9W
Palisades, NY 10964 USA
(1-845) 365-8988
Fax (1-845) 365-8922
ciesin.info@ciesin.columbia.edu
www.ciesin.columbia.edu

Yale Center for Environmental Law and Policy
250 Prospect Street
New Haven, CT 06511 USA
(1-203) 203 432-3123
Fax (1-203) 432-3817
ycelp@yale.edu
www.yale.edu/envirocenter

This report is available on-line at http://www.ciesin.columbia.edu/indicators/ESI

Table of Contents

21 March 2002

Executive Summary

The Environmental Sustainability Index (ESI) measures overall progress toward environmental sustainability for 142 countries. Environmental sustainability is measured through 20 "indicators," each of which combines two to eight variables, for a total of 68 underlying data sets. The ESI tracks relative success for each country in five core components:

- Environmental Systems
- Reducing Stresses
- Reducing Human Vulnerability
- Social and Institutional Capacity
- Global Stewardship

The indicators and the variables on which they are constructed were chosen through an extensive review of the environmental literature, assessment of available data, and broad-based consultation and analysis.

The five highest ranking countries are Finland, Norway, Sweden, Canada, and Switzerland. The five lowest countries are Haiti, Iraq, North Korea, Kuwait, and the United Arab Emirates. The higher a country's ESI score, the better positioned it is to maintain favorable environmental conditions into the future.

No country is above average in each of the 20 indicators, nor is any country below average in all 20. Every country has room for improvement, and no country can be said to be on a sustainable environmental path.

The ESI permits cross-national comparisons of environmental sustainability in a systematic and quantitative fashion. It assists the move toward a more analytically rigorous and data driven approach to environmental decision-making. In particular, the ESI enables:

- identification of issues where national performance is above or below expectations
- priority-setting among policy areas within countries and regions
- tracking of environmental trends
- quantitative assessment of the success of policies and programs
- investigation into interactions between environmental and economic performance, and into the factors that influence environmental sustainability

Although the ESI is broadly correlated with per-capita income, the level of development does not alone determine environmental circumstances. For some indicators there is a strong negative relationship with per-capita income. Moreover, within income brackets, country results vary widely. Environmental sustainability is therefore *not* a phenomenon that will emerge on its own from the economic development process, but rather requires focused attention on the part of governments, the private sector, communities and individual citizens.

The ESI combines measures of current conditions, pressures on those conditions, human impacts, and social responses because these factors collectively constitute the most effective metrics for gauging the prospects for long-term environmental sustainability, which is a function of underlying resource endowments, past practices, current environmental results, and capacity to cope with future challenges. Because the concept of sustainability is fundamentally centered on trends into the future, the ESI explicitly goes beyond simple measures of current performance. To assist in gauging current results and to support performance-based benchmarking, we have created a parallel Environmental Performance Index (EPI), which ranks countries according to present outcomes in air and water quality, land protection, and climate change prevention.

The ESI has been developed through an open and interactive process, drawing on statistical, environmental, and analytical expertise from around the world. The ESI has been subjected to extensive peer review and the methodology has been refined in response to a number of critiques.

The ESI integrates a large amount of information on a number of different dimensions of sustainability. Because individuals may weigh these dimensions differently in judging overall performance, this report provides detailed information on the ESI's methodology and its data sources. This transparency is meant to facilitate understanding of the ESI and exploration of alternative analyses, and debate over how best to promote environmental sustainability. The ESI demonstrates that it is possible to derive quantitative measures of environmental sustainability that are comparable across a large number of countries. Comparative analysis supports efforts to identify critical environmental trends, track the success (or failure) of policy interventions, benchmark performance, and identify "best practices."

The effort to construct a comprehensive index covering the full spectrum of pollution control and natural resource management issues spanning a large number of countries reveals the impoverished state of environmental metrics and data across much of the world. It also reinforces the conclusion that significant data gaps hamper good environmental analysis in every country. Serious movement toward a more empirical understanding of environmental sustainability will require an increased investment in monitoring, data collection, and analysis at the global, regional, national and local levels. A commitment to improved environmental data collection, indicator tracking, and performance measurement would be a worthy initiative for the governments gathered at the World Summit on Sustainable Development in Johannesburg in September 2002.

Figure 1. Map of 2002 Environmental Sustainability Index Country Scores

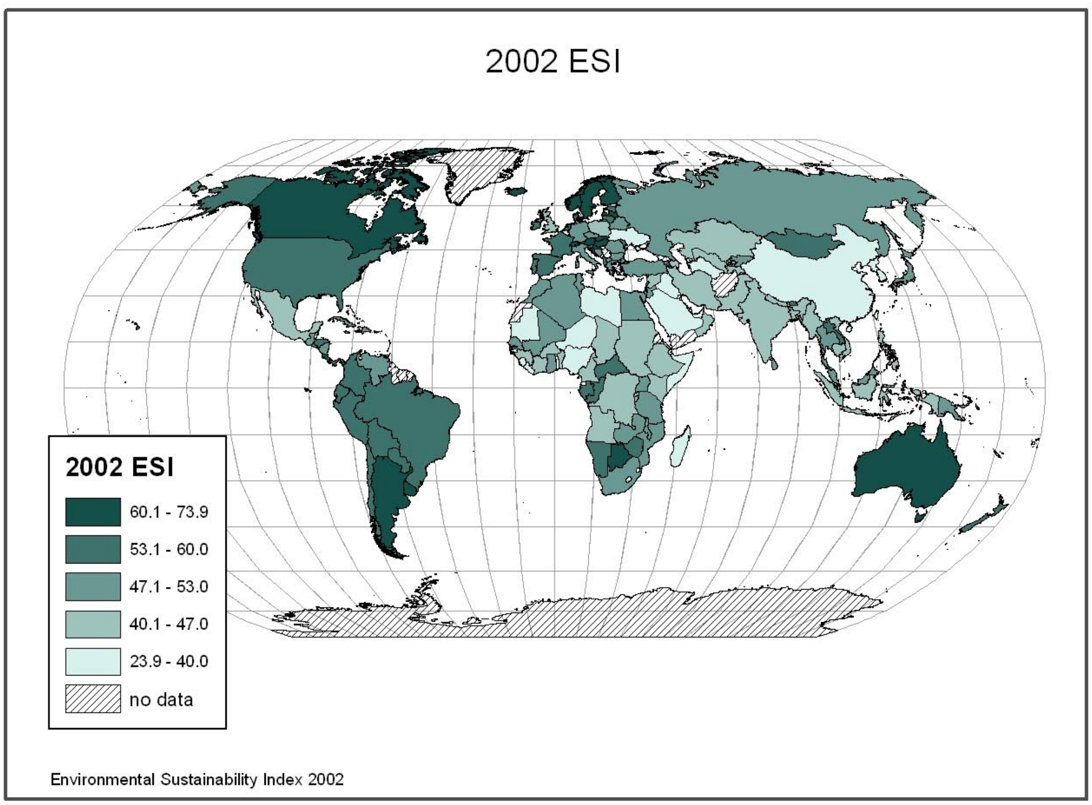


Table 1. 2002 Environmental Sustainability Index (ESI)

Rank	Country	ESI
1	Finland	73.9
2	Norway	73.0
3	Sweden	72.6
4	Canada	70.6
5	Switzerland	66.5
6	Uruguay	66.0
7	Austria	64.2
8	Iceland	63.9
9	Costa Rica	63.2
10	Latvia	63.0
11	Hungary	62.7
12	Croatia	62.5
13	Botswana	61.8
14	Slovakia	61.6
15	Argentina	61.5
16	Australia	60.3
17	Panama	60.0
18	Estonia	60.0
19	New Zealand	59.9
20	Brazil	59.6
21	Bolivia	59.4
22	Colombia	59.1
23	Slovenia	58.8
24	Albania	57.9
25	Paraguay	57.8
26	Namibia	57.4
27	Lithuania	57.2
28	Portugal	57.1
29	Peru	56.5
30	Bhutan	56.3
31	Denmark	56.2
32	Laos	56.2
33	France	55.5
34	Netherlands	55.4
35	Chile	55.1
36	Gabon	54.9
37	Ireland	54.8
38	Armenia	54.8
39	Moldova	54.5
40	Congo	54.3
41	Ecuador	54.3
42	Mongolia	54.2
43	Central Af. Rep.	54.1
44	Spain	54.1
45	United States	53.2
46	Zimbabwe	53.2
47	Honduras	53.1
48	Venezuela	53.0
49	Byelarus	52.8
50	Germany	52.5
51	Papua N G	51.8
52	Nicaragua	51.8
53	Jordan	51.7
54	Thailand	51.6
55	Sri Lanka	51.3
56	Kyrgyzstan	51.3
57	Bosnia and Herze.	51.3
58	Cuba	51.2
59	Mozambique	51.1
60	Greece	50.9
61	Tunisia	50.8
62	Turkey	50.8
63	Israel	50.4
64	Czech Republic	50.2
65	Ghana	50.2
66	Romania	50.0
67	Guatemala	49.6
68	Malaysia	49.5
69	Zambia	49.5
70	Algeria	49.4
71	Bulgaria	49.3
72	Russia	49.1
73	Morocco	49.1
74	Egypt	48.8
75	El Salvador	48.7
76	Uganda	48.7
77	South Africa	48.7
78	Japan	48.6
79	Dominican Rep.	48.4
80	Tanzania	48.1
81	Senegal	47.6
82	Malawi	47.3
83	Macedonia	47.2
84	Italy	47.2
85	Mali	47.1
86	Bangladesh	46.9
87	Poland	46.7
88	Kazakhstan	46.5
89	Kenya	46.3
90	Myanmar (Burma)	46.2
91	United Kingdom	46.1
92	Mexico	45.9
93	Cameroon	45.9
94	Vietnam	45.7
95	Benin	45.7
96	Chad	45.7
97	Cambodia	45.6
98	Guinea	45.3
99	Nepal	45.2
100	Indonesia	45.1
101	Burkina Faso	45.0
102	Sudan	44.7
103	Gambia	44.7
104	Iran	44.5
105	Togo	44.3
106	Lebanon	43.8
107	Syria	43.6
108	Ivory Coast	43.4
109	Zaire	43.3
110	Tajikistan	42.4
111	Angola	42.4
112	Pakistan	42.1
113	Ethiopia	41.8
114	Azerbaijan	41.8
115	Burundi	41.6
116	India	41.6
117	Philippines	41.6
118	Uzbekistan	41.3
119	Rwanda	40.6
120	Oman	40.2
121	Trinidad and Tob.	40.1
122	Jamaica	40.1
123	Niger	39.4
124	Libya	39.3
125	Belgium	39.1
126	Mauritania	38.9
127	Guinea-Bissau	38.8
128	Madagascar	38.8
129	China	38.5
130	Liberia	37.7
131	Turkmenistan	37.3
132	Somalia	37.1
133	Nigeria	36.7
134	Sierra Leone	36.5
135	South Korea	35.9
136	Ukraine	35.0
137	Haiti	34.8
138	Saudi Arabia	34.2
139	Iraq	33.2
140	North Korea	32.3
141	United Arab Em.	25.7
142	Kuwait	23.9

Note: 2002 ESI scores are not directly comparable to the 2001 ESI scores. See page 21, "Evolution of the ESI Methodology," and Annex 2 for details.

The Need for an Environmental Sustainability Index

Efforts to construct an Environmental Sustainability Index (reported on in this report) and an Environmental Performance Index (EPI) focused more narrowly on current pollution control and natural resource management results (see related report) are part of a broader push to establish firmer foundations for environmental decisionmaking (see Esty and Cornelius 2002; Esty and Porter 2001). In the business world it has long been understood that "what matters gets measured." But in the environmental domain decisions have often been made without empirical underpinnings and thus without sufficient analytic rigor.

The ESI seeks to make the concept of environmental sustainability more concrete and functional by grounding it in real-world data and analysis. As we approach the ten-year anniversary of the 1992 Rio Earth Summit and the 2002 World Summit on Sustainable Development in Johannesburg, efforts are underway to take stock of the progress made in addressing environmental challenges over the past decade (e.g., United Nations 2001). Given the broad embrace of environmental sustainability goals at Rio, it is striking how weak the ability to measure sustainability remains. Partly as a result of the lack of reliable metrics to track progress and to gauge the success of policy interventions, implementation of environmental sustain-ability goals has been spotty and erratic. Efforts to understand baseline conditions, to set priorities, to establish targets, to identify trends, and to understand the determinants of policy success have on the whole failed to materialize.

With regard to a handful of environmental issues, progress in developing empirical understanding has not been so bleak. For example, climate change, deforestation, and ozone depletion have all been carefully tracked on a numerical basis. But the lack of a current and reliable data across the entire range of environmental sustainability issues has hampered efforts to identify the determinants of environmental success and long-term sustainability. The promise of sustainability as a diagnostic guide and cynosure for policymaking has therefore not been fulfilled.

Key Results

With 68 variables rolled into 20 core "indicators," the ESI creates overall environmental sustainability scores for 142 countries. The key results of the ESI and its analysis can be summarized as follows:

1. Environmental sustainability can be measured. While no measure of such a complex phenomenon can be perfect, the ESI has proven to be a surprisingly powerful and useful measure of the underlying conditions, current societal performance, and capacity for future policy interventions that determine long-term environmental trends.
2. No country is on a truly sustainable path. Every country has some issues on which its performance is below average. By assembling a vast array of data and metrics on a comparable basis across countries, the ESI helps to highlight opportunities for improvement and where best practices might be found.
3. Economic circumstances affect, but do not determine environmental results. ESI scores correlate positively with per-capita income. Most individual indicators show a positive relationship with level of development as well. However, within each income category wide variations in performance are evident. These results sug-

gest that decisions about how vigorously to pursue environmental sustainability and how to promote economic growth are in fact two separate choices.

4. Some of the other factors that appear to shape environmental sustainability include: the quality of governance, population density, and climate. As with economic conditions, however, none of these factors completely determine outcomes.

5. Serious data gaps limit the ability to measure environmental sustainability as completely as sound policymaking requires. Over 50 countries had to be eliminated from the ESI because of limited data coverage, and a number of critical environmental factors were either not measured at all or measured very imperfectly. Investment in better environmental monitoring and the development of time series data on key indicators represents a critical policy priority.

Our Approach

At the most basic level, environmental sustainability can be presented as a function of five phenomena (see Table 2): (1) the state of the Environmental Systems, such as air, soil, ecosystems, and water; (2) the Stresses on those systems, in the form of pollution and exploitation levels; (3) the Human Vulnerability to environmental change in the form of loss of food resources or exposure to environmental diseases; (4) the Social and Institutional Capacity to cope with environmental challenges; and, finally, (5) the ability to respond to the demands of Global Stewardship by cooperating in collective efforts to conserve international environmental resources such as the atmosphere. We define environmental sustainability as the ability to produce high levels of performance on each of these dimensions in a lasting manner. We refer to these five dimensions as the core "components" of environmental sustainability. We believe that the cumulative picture created by these five components represents a good gauge of a country's likely environmental quality a generation or two into the future.

Table 2. Components of environmental sustainability

Component	Logic
Environmental Systems	A country is environmentally sustainable to the extent that its vital environmental systems are maintained at healthy levels, and to the extent to which levels are improving rather than deteriorating.
Reducing Environmental Stresses	A country is environmentally sustainable if the levels of anthropogenic stress are low enough to engender no demonstrable harm to its environmental systems.
Reducing Human Vulnerability	A country is environmentally sustainable to the extent that people and social systems are not vulnerable (in the way of basic needs such as health and nutrition) to environmental disturbances; becoming less vulnerable is a sign that a society is on a track to greater sustainability.
Social and Institutional Capacity	A country is environmentally sustainable to the extent that it has in place institutions and underlying social patterns of skills, attitudes, and networks that foster effective responses to environmental challenges.
Global Stewardship	A country is environmentally sustainable if it cooperates with other countries to manage common environmental problems, and if it reduces negative transboundary environmental impacts on other countries to levels that cause no serious harm.

Scientific knowledge does not permit us to specify precisely what levels of performance are high enough to be truly sustainable, especially at a worldwide scale. Nor are we able to identify in advance whether any given level of performance is capable of being carried out in a lasting manner. Therefore we have built our index in a way that is primarily comparative. Establishing the thresholds of sustainability remains an important endeavor, albeit one that is complicated by the dynamic nature of such economic factors as changes in technology over time.[1]

The basic unit of comparison is a set of 20 environmental sustainability "indicators" (see Table 3). These were identified on the basis of a careful review of the environmental literature, expert advice, statistical analysis as well as peer review comments and critical assessments of the 2001 ESI.

Each indicator, in turn, has associated with it a number of variables that are empirically measured. The choice of variables was driven by a consideration of a number of factors including: country coverage, the recency of the data, direct relevance to the phenomenon that the indicators are intended to measure, and quality (these considerations are outlined in Table A1.1 of Annex 1). Wherever possible we sought to use direct measures of the phenomena we wanted to capture. But in some cases, "proxies" had to be employed. In general we sought variables with extensive country coverage but chose in some cases to make use of variables with narrow coverage if they measured critical aspects of environmental sustainability that would otherwise be lost. Annex 1 of the report provides a descriptive analysis of the strengths and weaknesses of the 20 indicators and the variables that comprise them. Annex 6 provides the logic for each variable's inclusion in the ESI.

After building up the complete database, we selected countries for inclusion in the index based on the extent of their data coverage, their total population and the size of their territory. Countries below 100,000 population, under 5,000 square kilometers size, and lacking sufficient data to generate indicator values were eliminated (see Annex 2 for details). We ended up with 142 countries in the Index.

Missing data are an endemic problem for anyone working with environmental indicators. There is not a single country that is covered by each of the 68 variables used in the ESI. The median country in the Index is missing 16 variables, a quarter are missing 22-28, and a quarter are missing 1-7. Altogether, this means that 22 percent of the 9,656 data points in our database were missing. We estimated missing values for 24 variables, based on a judgment that these variables were significantly correlated with other variables in the data set, and with a small number of external predictive variables. A detailed explanation of the imputation methodology is found in Annex 3 of this report. By estimating these missing values we were able to generate reliable measures on each of the 20 ESI indicators for each of the 142 countries.

Table 3. Environmental Sustainability Index Building Blocks

Component	Indicator	Variable
Environmental Systems	Air Quality	Urban SO_2 concentration
		Urban NO_2 concentration
		Urban TSP concentration
	Water Quantity	Internal renewable water per capita
		Per capita water inflow from other countries
	Water Quality	Dissolved oxygen concentration
		Phosphorus concentration
		Suspended solids
		Electrical conductivity
	Biodiversity	Percentage of mammals threatened
		Percentage of breeding birds threatened
	Land	Percent of land area having very low anthropogenic impact
		Percent of land area having high anthropogenic impact
Reducing Stresses	Reducing Air Pollution	NO_x emissions per populated land area
		SO_2 emissions per populated land area
		VOCs emissions per populated land area
		Coal consumption per populated land area
		Vehicles per populated land area
	Reducing Water Stress	Fertilizer consumption per hectare of arable land
		Pesticide use per hectare of crop land
		Industrial organic pollutants per available fresh water
		Percentage of country's territory under severe water stress
	Reducing Ecosystem Stresses	Percentage change in forest cover 1990-2000
		Percentage of county with acidification exceedence
	Reducing Waste & Consumption Pressures	Ecological footprint per capita
		Radioactive waste
	Reducing Population Growth	Total fertility rate
		Percentage change in projected pop. between 2001 & 2050
Reducing Human Vulnerability	Basic Human Sustenance	Proportion of undernourished in total population
		Percent of pop. with access to improved drinking-water supply
	Environmental Health	Child death rate from respiratory diseases
		Death rate from intestinal infectious diseases
		Under-5 mortality rate

Table 3. Environmental Sustainability Index Building Blocks (continued)

Component	Indicator	Variable
Social and Institutional Capacity	Science and Technology	Technology achievement index
		Technology Innovation Index
		Mean years of education
	Capacity for Debate	IUCN member organizations per million population
		Civil & political liberties
		Democratic institutions
		Percentage of ESI variables in publicly available data sets
	Environmental Governance	WEF survey questions on environmental governance
		Percentage of land area under protected status
		Number of sectoral EIA guidelines
		FSC accredited forest area as a percent of total forest area
		Control of corruption
		Price distortions (ratio of gasoline price to international average)
		Subsidies for energy or materials usage
		Subsidies to the commercial fishing sector
	Private Sector Responsiveness	Number of ISO14001 certified companies per million $ GDP
		Dow Jones Sustainability Group Index
		Average Innovest EcoValue rating of firms
		World Business Council for Sustainable Development members
		Private sector environmental innovation
	Eco-efficiency	Energy efficiency (total energy consumption per unit GDP)
		Renewable energy production as a percent of total energy consumption
Global Stewardship	Participation in International Collaborative Efforts	Number of memberships in environmental intergovernmental organizations
		Percentage of CITES reporting requirements met
		Levels of participation in the Vienna Convention/Montreal Protocol
		Levels of participation in the Climate Change Convention
		Montreal protocol multilateral fund participation
		Global environmental facility participation
		Compliance with Environmental Agreements
	Greenhouse Gas Emissions	Carbon lifestyle efficiency (CO_2 emissions per capita)
		Carbon economic efficiency (CO_2 emissions per dollar GDP)
	Reducing Transboundary Environmental Pressures	CFC consumption (total times per capita)
		SO_2 exports
		Total marine fish catch
		Seafood consumption per capita

Main Findings

To calculate the over-arching Environmental Sustainability Index, we averaged the values of the 20 indicators and calculated a standard normal percentile for each country. The results are shown in Table 1, which appears on page 3. We also calculated indices for each of the five core components, which are reported in Annex 4. (ESI scores, including scores of indicators, components, and variables, are consistently reported so that high values correspond to high levels of environmental sustainability.)

Countries score high in the ESI if the average of their individual indicator scores is high relative to other countries. The ESI score can be interpreted as a measure of the relative likelihood that a country will be able to achieve and sustain favorable environmental conditions several generations into the future. Given their relative strength across the past, present, and future dimensions of sustainability, countries at the top of the Index are more likely than those at the bottom to experience lasting environmental quality. The dynamic nature of the environmental realm and the lack of information on critical resource thresholds limits our ability to draw conclusions about the long term environmental sustainability of particular countries. Such a judgment would require much more detailed information on reserve depletion rates, assimilative capacities, and system interactions than is currently available. Nevertheless, global environmental data as well as the fact that every country has issues on which it is under performing makes it likely that no country is on a fully sustainable trajectory.

Because the 20 indicators span many distinct dimensions of environmental sustainability, it is possible, moreover, for countries to have similar ESI scores but very different environmental profiles. The Netherlands and Laos, for example, have very similar ESI scores of 55.2 and 56.3. But they have mirror image patterns for many indicators. Laos has relatively poor scores for human vulnerability, capacity, and water quality, areas in which the Netherlands is relatively strong. Likewise, while the Netherlands has quite poor scores for air and water pollution emissions as well as climate change and transboundary pollution, Laos has relatively good results on these metrics. Country by country profiles showing each of the 20 indicator values can be found in Annex 5 to this report.

Cluster Analysis

To help facilitate relevant comparisons across countries with similar profiles, we have undertaken a "cluster" analysis. Cluster analysis provides a basis for identifying similarities among countries across multiple heterogeneous dimensions. The cluster analysis performed on the ESI data set reveal five groups of countries that had distinctive patterns of results across the 20 indicators. The results are presented in Table 4.

Table 4. Cluster Analysis Results

1) High human vulnerability; moderate systems and stresses	2) Low vulnerability; moderate systems and moderate stresses	3) Low vulnerability; poor systems and high stresses	4) Moderate vulnerability, systems and stresses; but low capacity	5) Moderate vulnerability, systems and stresses; average capacity
Angola	Australia	Austria	Azerbaijan	Albania
Benin	Canada	Belgium	Iraq	Algeria
Bhutan	Estonia	Czech Republic	Kazakhstan	Argentina
Bolivia	Finland	Denmark	Kuwait	Armenia
Burkina Faso	Iceland	France	Libya	Bangladesh
Burundi	Ireland	Germany	North Korea	Bosnia and Herze.
Cambodia	Israel	Hungary	Oman	Botswana
Cameroon	New Zealand	Italy	Russia	Brazil
Central Af. Rep.	Norway	Japan	Saudi Arabia	Bulgaria
Chad	Sweden	Macedonia	Trinidad and Tobago	Byelarus
Congo	United States	Netherlands	Turkmenistan	Chile
Ethiopia		Poland	Ukraine	China
Gabon		Slovakia	United Arab Emirates	Colombia
Gambia		Slovenia	Uzbekistan	Costa Rica
Ghana		South Korea		Croatia
Guatemala		Spain		Cuba
Guinea		Switzerland		Dominican Rep.
Guinea-Bissau		United Kingdom		Ecuador
Haiti				Egypt
Ivory Coast				El Salvador
Kenya				Greece
Laos				Honduras
Liberia				India
Madagascar				Indonesia
Malawi				Iran
Mali				Jamaica
Mauritania				Jordan
Mozambique				Kyrgyzstan
Myanmar				Latvia
Nepal				Lebanon
Nicaragua				Lithuania
Niger				Malaysia
Nigeria				Mexico
Pakistan				Moldova
Papua New Guinea				Mongolia
Paraguay				Morocco
Rwanda				Namibia
Senegal				Panama
Sierra Leone				Peru
Somalia				Philippines
Sudan				Portugal
Tanzania				Romania
Togo				South Africa
Uganda				Sri Lanka
Zaire				Syria
Zambia				Tajikistan
				Thailand
				Tunisia
				Turkey
				Uruguay
				Venezuela
				Vietnam
				Zimbabwe

Table 5. Characteristics of Clusters

	Cluster:	1	2	3	4	5
	Number of countries	46	11	18	14	53
Average values of ESI Component Values	ESI	46.0	63.0	52.7	37.1	51.9
	Environmental Systems	50.8	65.6	44.2	41.6	50.1
	Reducing Environmental Stress	54.2	44.7	34.2	43.0	58.3
	Reducing Human Vulnerability	18.2	82.9	82.1	62.0	62.3
	Social and Institutional Capacity	39.0	75.3	67.4	29.5	44.5
	Global Stewardship	61.3	47.8	51.5	22.1	49.2
Average values of other characteristics	Spatial Index of Density (31 to 91)	58.1	49.3	76.6	57.0	63.1
	Per Capita Income	$1,417	$22,216	$18,260	$7,481	$5,210
	Democratic Institutions (-9 to 10)	.15	9.64	9.50	-4.57	4.10
	Controlling Corruption (-1.3 to 2.1)	-.66	1.66	.99	-.52	-.23
	Current Competitiveness Index (0 to 10)	.75	8.32	7.55	3.38	3.41
	Total Area (square kilometers)	535,624	2,507,768	178,269	1,849,669	874,352
	Distance from Equator (degrees latitude)	11.9	52.8	46.6	35.4	27.6

In Table 5 these clusters are compared according to the average values of their scores on the ESI and its five core components, as well as the values of other variables that may play a role in explaining their cluster membership.

The first two clusters have roughly similar scores on environmental systems and reducing stresses, but starkly disparate scores on vulnerability and capacity. These two groups are the two most divergent in terms of their socioeconomic conditions, institutions, and locations. The first group is generally poor, vulnerable to corruption, undemocratic, and economically uncompetitive. The second cluster tends to show the opposite characteristics. Note that the first group has superior scores on global stewardship, largely reflecting its very low levels of consumption (and thus a limited burden on the global commons) induced by economic underdevelopment and poverty.

Comparing the second and third clusters, the main difference in terms of environmental sustainability measures is that the third group has markedly lower scores on environmental systems and stresses; the other scores are roughly similar. These two groups are quite similar in terms of socioeconomic conditions and institutions. The third group has generally higher population densities and significantly smaller average territory size.

In comparing the fourth and fifth groups, other differences come to the fore. Although the fourth group has slightly better vulnerability scores, it ranks lower in the other four categories and on the overall ESI average. Group four has especially low capacity scores, which portend a weak ability to cope with unfolding environmental challenges. The main institutional difference between these groups is that group four is, on average, less democratic than group five. It is interesting that the less democratic group produces lower ESI scores in spite of the fact that its average per-capita income about 25 percent higher. These undemocratic poor countries also score anomalously lower on measures of global stewardship than the other poor countries. Thus, the cluster analysis seems to confirm the earlier observation that, while income (i.e., level of development) is an important determinant of environmental results, other factors are equally significant.

There are other ways to divide the world into categories, but this analysis, based on measures of environmental sustainability, reveals a set of useful patterns. It suggests a number of interesting areas for future research and policy debate concerning potential drivers of environmental sustainability.

Figure 2. Radar graphs of ESI component scores by cluster

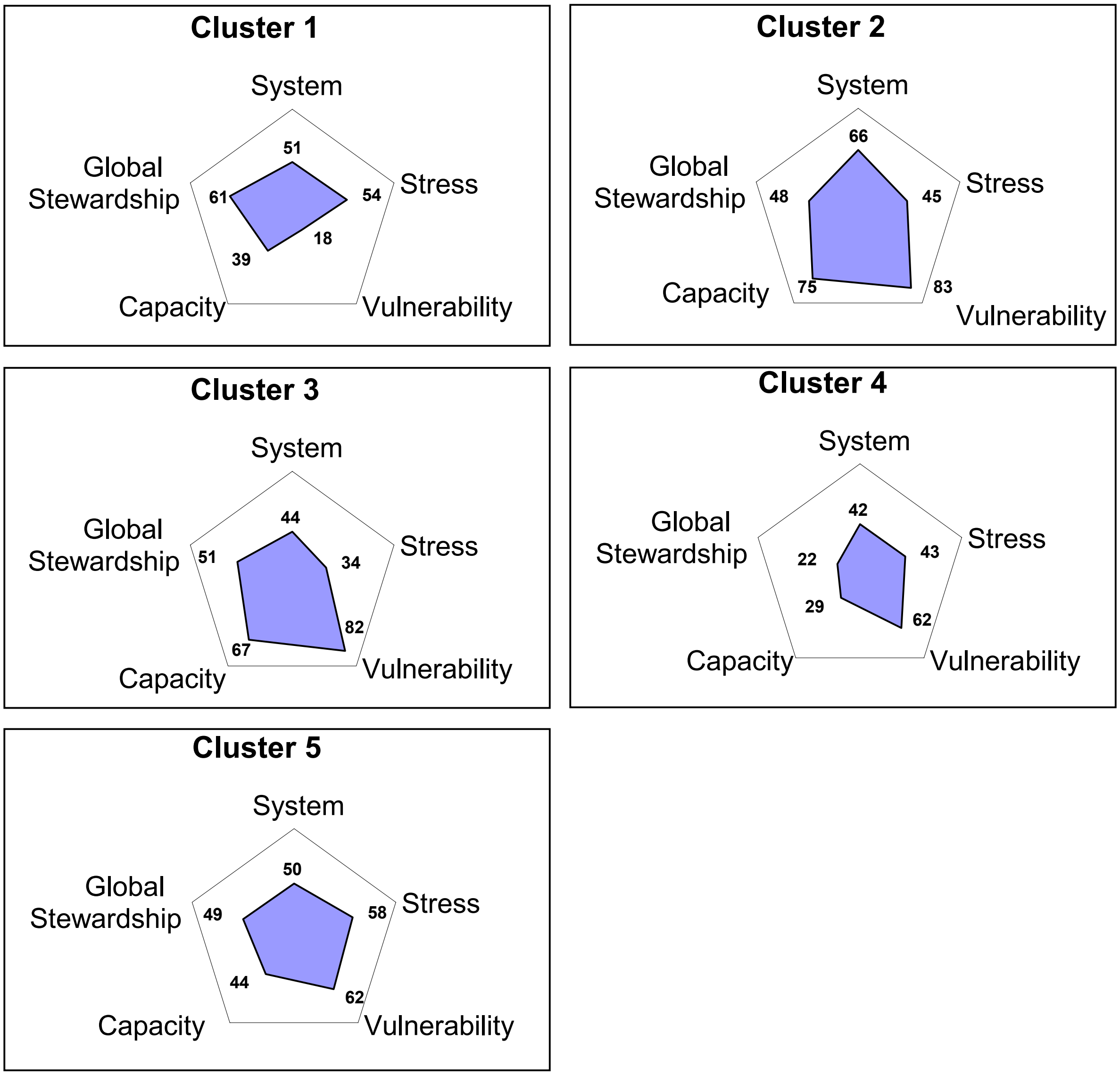
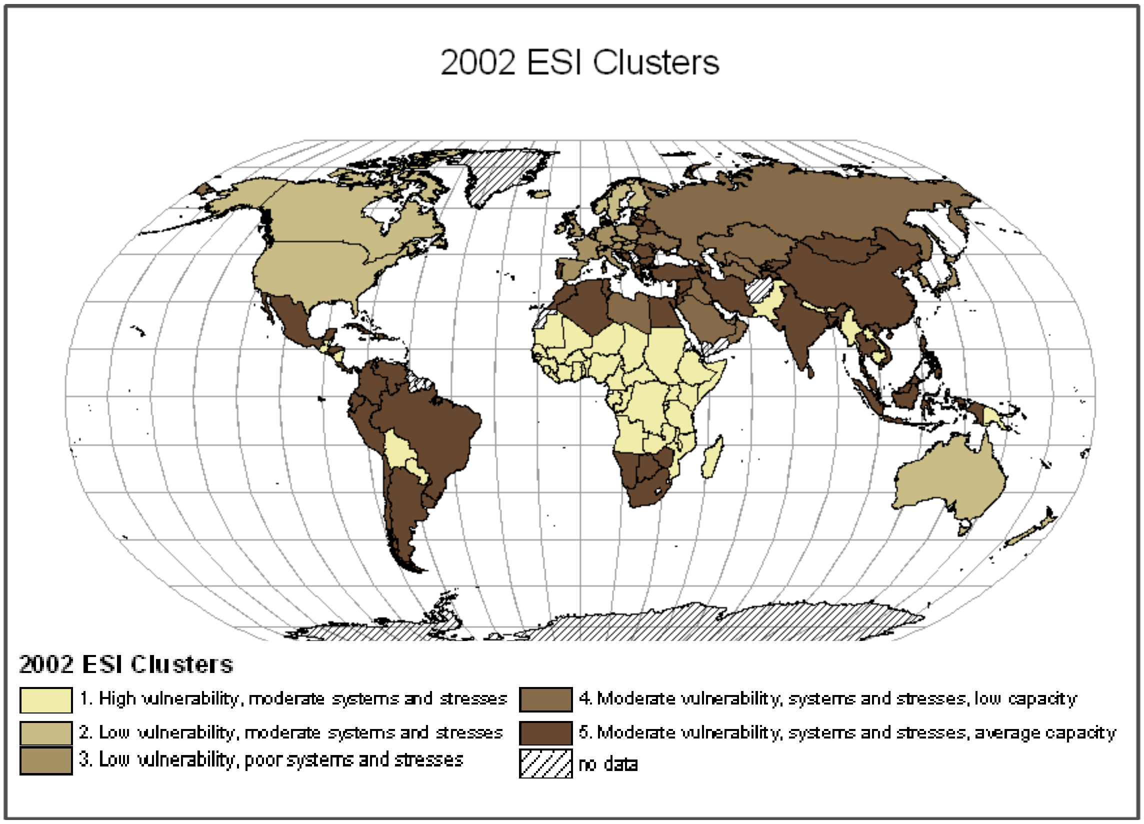


Figure 3. Map of 2002 Environmental Sustainability Index Clusters



Relationship to Economic Performance

Whether environmental conditions improve as a direct result of improvements in economic development or whether economic development puts pressure on the environment, or whether there are even more complicated relationships between economic and environmental outcomes, are questions that lie at the heart of major policy debates. For instance, understanding of the welfare effects of trade and investment liberalization has been limited by the dearth of environmental data to hold up against the abundant economic data.[2] We report here on some initial analysis made possible by the ESI.

At the broadest level, as seen in Figure 4, there is a significant positive correlation between per-capita income and the ESI. The correlation coefficient is .39, which is significant at the .001 level (the correlation with the log of per-capita income is slightly higher, at .44).

Figure 4. The relationship between GDP per capita and the 2002 ESI

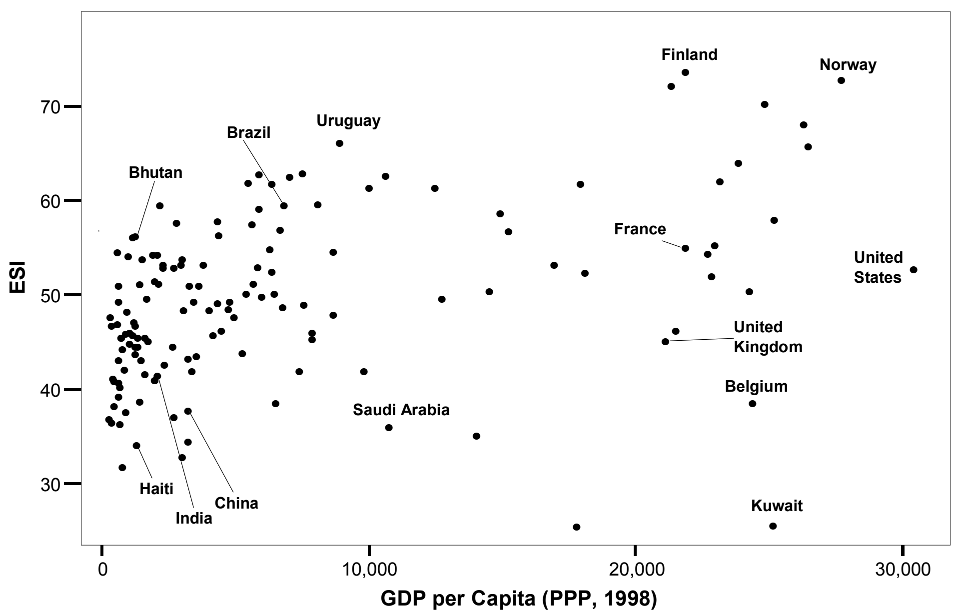


Table 6. Correlations between ESI Indicators and GDP per capita

	Indicator	Correlation Coefficient
Indicators with statistically significant positive correlation with GDP per capita	Science and Technology	0.84
	Environmental Governance	0.66
	Private Sector Responsiveness	0.66
	Environmental Health	0.65
	Basic Human Sustenance	0.64
	Air Quality	0.57
	Participation in International Cooperative Efforts	0.58
	Reducing Population Growth	0.51
	Water Quality	0.52
	Capacity for Debate	0.40
Indicators with statistically significant negative correlation with GDP per capita	Reducing Waste and Consumption Pressures	-0.80
	Reducing Air Pollution	-0.62
	Reducing Greenhouse Gas Emissions	-0.46
	Reducing Water Stress	-0.45
	Reducing Transboundary Environmental Pressures	-0.36
	Land	-0.32
	Biodiversity	-0.20
Indicators with no statistically significant correlation with GDP per capita	Water Quantity	-0.09
	Reducing Ecosystem Stress	-0.07
	Eco-efficiency	-0.15

But clearly income does not determine a country's ESI. Within income groups, a considerable range in outcomes exists. Kuwait and Belgium score far below Finland among high-income countries. Likewise, Saudi Arabia comes in far below Uruguay among medium-income countries, and Haiti badly lags Bhutan among low-income countries.

Considering the 20 indicators that comprise the ESI, there is considerable variation in the correlation with per-capita income, as seen in Table 6. In general, wealthy countries have higher scores on social and institutional capacity measures, and on measures of current ambient conditions (land and biodiversity are exceptions) as well as on measures of reducing human vulnerability. Less wealthy countries generate lower environmental stress, producing better scores on the waste and emissions (population is an exception) indicators as well as protecting the global commons.

Even for the indicators most strongly correlated with income, relative wealth alone does not determine outcomes. For example, Korea has a far higher Science and Technology score than Portugal, Sweden a far higher score than Italy, and Estonia a far higher score than Saudi Arabia, even though each pair of countries has similar levels of GDP per capita.

The ESI also permits an analysis of the correlation between economic competitiveness and environmental sustainability. This relationship is important because some theorists have argued that these two policy goals are in counterpoise, and that environmental gains come at the price of economic strength and vice versa. The World Economic Forum's 2001 Current Competitiveness Index has a correlation of .34 with the ESI, which is statistically significant for the 71 countries that are in both the ESI and the Competitiveness Index (WEF 2001). A graph with some illustrative countries identified is seen in Figure 5.[3]

Countries in the top right, such as Finland, are positioned to perform well in terms of both medium-term economic growth and long-term environmental sustainability. Countries in the bottom left, such as Nigeria, are likely to do poorly on both fronts. In the bottom right are countries such as Belgium that are well positioned on economic grounds, but comparatively less well positioned in terms of long-term environmental sustainability. In the upper left are countries such as Uruguay that, while they are considerably less competitive economically than most other countries, are more likely to sustain positive environmental conditions into the future.

To obtain a more detailed understanding, we can also investigate the relationship between economic competitiveness and the 20 ESI indicators, as seen in Table 7.

Figure 5. The relationship between Economic Competitiveness and the 2002 ESI

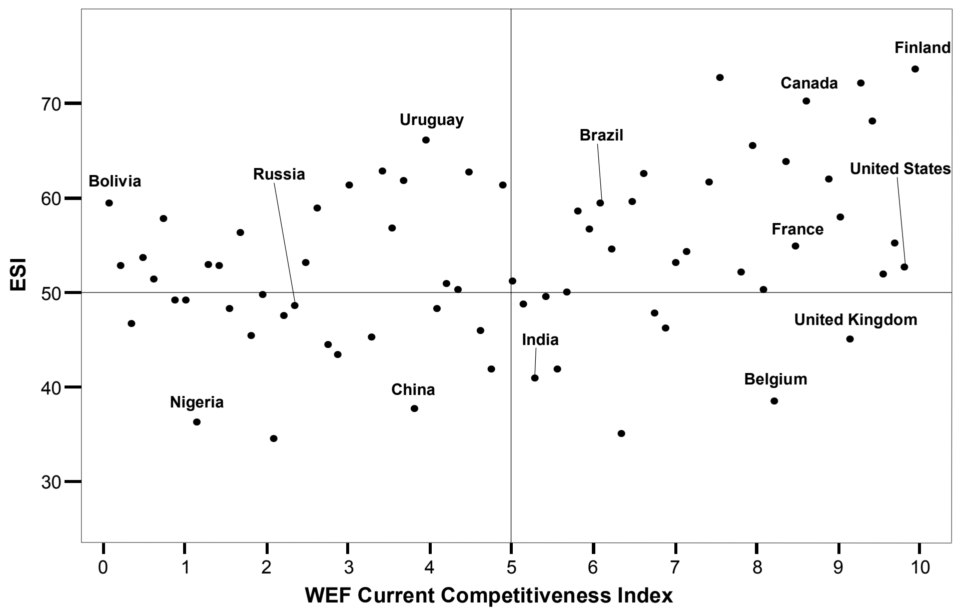


Table 7. Correlations between ESI indicators and Current Competitiveness Index

	Indicator	Correlation Coefficient
Indicators with statistically significant positive correlation with Current Competitiveness Index	Science and Technology	0.89
	Environmental Governance	0.81
	Basic Human Sustenance	0.75
	Participation in International Cooperative Efforts	0.74
	Private Sector Responsiveness	0.72
	Environmental Health	0.61
	Air Quality	0.57
	Reducing Population Growth	0.56
	Water Quality	0.47
	Capacity for Debate	0.27
Indicators with statistically significant negative correlation with Current Competitiveness Index	Reducing Waste and Consumption Pressures	-0.66
	Reducing Air Pollution	-0.57
	Reducing Water Stress	-0.35
	Reducing Greenhouse Gas Emissions	-0.42
	Land	-0.28
Indicators with no statistically significant correlation with Current Competitiveness Index	Eco-efficiency	-0.10
	Biodiversity	-0.14
	Reducing Ecosystem Stress	-0.17
	Water Quantity	-0.23
	Reducing Transboundary Env'tal Pressures	-0.16

A few preliminary conclusions can be drawn from these correlations. First, the strong relationship between competitiveness and good governance reinforces the conclusion that good economic management and good environmental management are related. Countries that are incapable of developing effective economic strategies are likely to fail to develop effective approaches to environmental challenges as well. Likewise, countries that succeed at one are likely to be able to succeed at the other. Corruption, civil liberties, and democratic institutions are also highly correlated with the overall ESI. These results tend to reinforce the suggestion (Esty and Porter 2001, Levy 2001) that those seeking to improve environmental performance should pay attention to the fundamentals of "governance."

Second, the very high correlation between competitiveness and the ESI's Private Sector Responsiveness indicator tends to corroborate the "Porter hypothesis," which suggests that firms which succeed in developing innovative responses to environmental challenges benefit both environmentally and economically (Dixon 2002, Flatz 2002, Porter 1991). Of the 68 variables within the ESI, several of the private sector responsiveness measures are among the most highly correlated with the aggregate ESI.[4] As a policy matter, this finding suggests that engaging the private sector in the response to environmental challenges is critical.

Finally, we find negative correlations between economic competitiveness and many of the environmental stress indicators as well as with the climate change indicators. These results suggest that, in spite of the overall positive relationship between the ESI and competitiveness, economic strength is not a "cure-all" for environmental ills. High pollution levels and rising greenhouse gas emissions are found in many strong economies, raising the specter of future negative quality of life impacts.

Other Factors Associated with Environmental Sustainability

Recognizing that per capita income does not alone determine the ESI or its constituent indicators, it becomes important to try to identify other factors which, when combined with per-capita income, help to explain the observed variation in environmental outcomes. We discuss below the results of some preliminary efforts to investigate this question.

As shown in Table 8, a number of other variables have significant correlations with the ESI, making them plausible drivers of environmental sustainability.

This table provides a number of clues as to where the search for the determinants of environmental success might lead. First, governance broadly conceived clearly influences ESI scores. Three independent data sets—the Heritage Foundation's measure of civil liberties, the University of Maryland's measure of democratic institutions, and the World Bank's measure of the control of corruption—all have strong and significant correlations with the ESI.

Second, geography seems to play some role in environmental sustainability, as suggested by the negative correlation between ESI scores and population density.[5] We also found significant correlations between the ESI and a number of other geographical factors, including distance from equator and climatic zones. Causality is difficult to untangle in these locational measures. Probing the precise influence of geographic factors on environmental sustainability remains an important area of future work.

Table 8. Correlations between potential drivers of environmental sustainability and the 2002 ESI

Variable with Statistically Significant Correlation with ESI	Correlation coefficient
Civil & political liberties	0.56
Interaction of GDP and democratic Institutions	0.54
Democratic institutions	0.51
Reducing corruption	0.53
GDP per capita (log)	0.45
Spatial Index of population density	-0.22
All correlations are significant at .01 level or better (two-tailed)	

Comparison to other Sustainability Indicators

In the last two years several alternative approaches to measuring national environmental sustainability have emerged. Prescott-Allen's Wellbeing Index combines a number of measures of human welfare and ecosystem health, producing three aggregated measures: a Human Wellbeing Index, an Ecosystem Wellbeing Index, and a Wellbeing Index which is the average of the other two (Prescott-Allen 2001). The Consultative Group on Sustainable Development Indicators (2002), in collaboration with the UN Commission on Sustainable Development (CSD), has produced a "straw" set of sustainability indicators organized around the CSD's indicator framework. These straw indicators include aggregated measures on the environment, social issues, the economy, and institutions, as well as an average of these four. Finally, the Ecological Footprint, produced by the Redefining Progress Institute,

Table 9. Comparison of ESI indicators to Alternative Environmental Sustainability Indicators

	Wellbeing Index	Human Wellbeing Index	Ecosystem Wellbeing Index	CGSDI Overall	CGSDI Environment	CGSDI Social	CGSDI Economic	CGSDI Institutional	Ecological Footprint Deficit
Environmental Sustainability Index	+	+		+	+	+		+	+
Air Quality	+	+	-	+		+		+	
Water Quantity	+		+		+	+			+
Water Quality	+	+		+	+	+		+	
Biodiversity		-	+		+	-			
Land	-	-	+	-		-		-	+
Reducing Air Pollution	-	-	+	-	+	-		-	+
Reducing Water Stress		-	+		+	-		-	+
Reducing Ecosystem Stress					-				
Reducing Waste and Consumption Pressures	-	-	+	-	+	-	+	-	+
Reducing Population Growth	+	+	-	+		+		+	-
Basic Human Sustenance	+	+	-	+	-	+		+	-
Environmental Health	+	+	-	+	-	+		+	-
Science and Technology	+	+	-	+	-	+		+	-
Capacity for Debate	+	+		+		+		+	
Environmental Governance	+	+		+	+	+		+	
Private Sector Responsiveness	+	+	-	+		+		+	-
Eco-efficiency		-	+		+	-	+		+
Participation in International Cooperative Efforts	+	+	-	+		+		+	
Reducing Greenhouse Gas Emissions		-	+	-	+	-	+	-	+
Reducing Transboundary Environmental Pressures		-	+	-		-		-	

+ = statistically significant positive correlation (at .01 level)
- = statistically significant negative correlation (at .01 level)

provides a third alternative. In Table 9 we summarize correlations between these indices and the ESI and its component indicators.

The two most aggregated indexes, the Wellbeing Index and the CGSDI Overall Index, have significant correlations with the ESI (.73 and .60 respectively).

Each of these alternative indices has a number of significant positive correlations with some of the ESI indicators. The pattern of these correlations reveals the primary differences among the sustainability measurement efforts. The most aggregated indices have the largest number of positive correlations. The Wellbeing Index has positive correlations with 11 of the ESI's 20 indicators, and the CGSDI Overall Index has positive correlations with 10 of them.

The indices that purport to measure environmental conditions more narrowly such as air and water quality have, not surprisingly, the greatest correlations with the Environmental Systems and Environmental Stress indicators of the ESI. The Ecosystem Wellbeing Index, for example, clearly maps more closely to the

Environmental Systems and Stresses indicators of the ESI than the Human Wellbeing Index, which for its part maps closely to the ESI's vulnerability and capacity indicators.

Figure 6. Relationship between the Wellbeing Index and the 2002 ESI

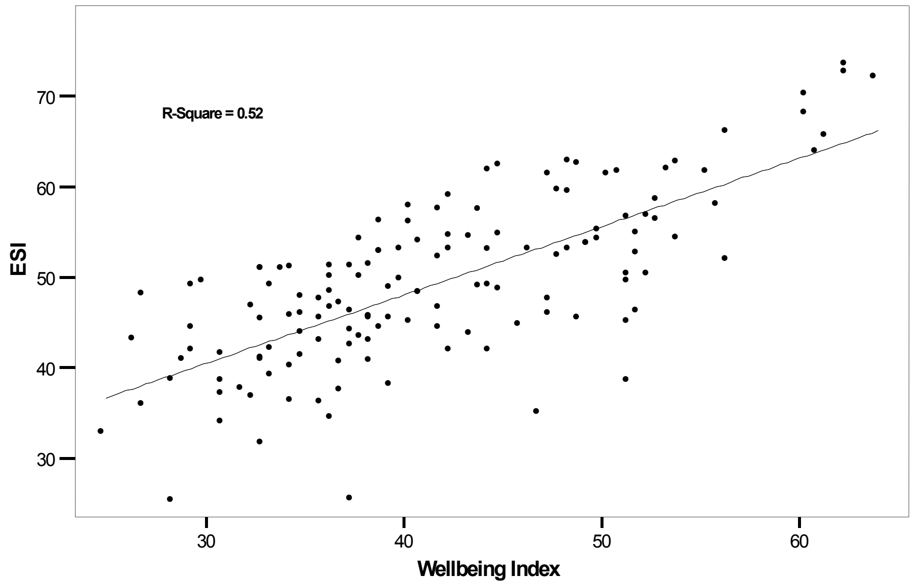
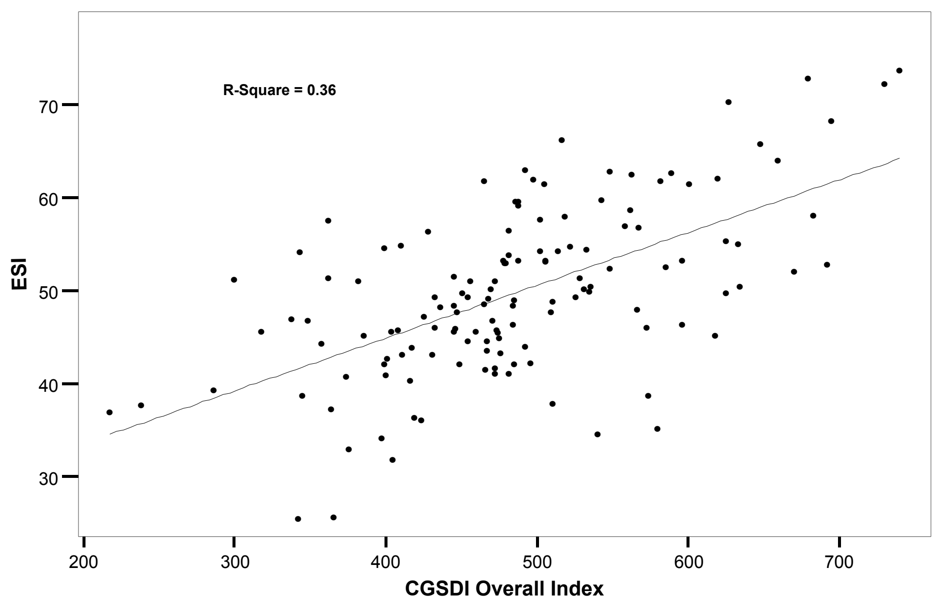


Figure 7. Relationship between the Consultative Group for Sustainability Indicators' Overall Index and the 2002 ESI



In general, there is greater convergence among the more human-oriented metrics than there is among the more ecosystem-oriented indicators. This result reflects a combination of two clear differences between these categories of metrics. First, there is greater consensus about which human-focused issues matter most than there is on the ecosystem-focused issues (Parris and Kates 2001). Second, the available data is in general more reliable, more plentiful, and more regularly updated on human variables than on ecosystem measures. As a result, choices about how to create ecosystem-oriented indicators tend to diverge, lacking a clear grounding in either analytical frameworks or in available data. An illustration of this dichotomy is that it is possible to construct a regression model that uses the ESI's Vulnerability and Capacity measures to predict the Human Wellbeing Index with an r^2 of .90, with all the coefficients positive. However, using the ESI's System, Stress, Greenhouse Gas Emissions and Transboundary Pressures indicators to predict the Ecosystem Wellbeing Index produces an r^2 of .66, and not all the coefficients are positive.

Evolution in the ESI Methodology

The 2001 ESI had 22 indicators: 7 indicators in the social and institutional capacity component, 5 each in the environmental systems and reducing stresses components, 3 in the global stewardship component, and 2 in the reducing human vulnerability component (Levy 2002). Because the ESI is calculated as an unweighted average of the indicator scores, this structure resulted in giving greatest weight to the social and institutional capacity component. In this year's ESI, we combined two of the indicators in that component: Environmental Information was merged into Capacity for Debate (on the assumption that effective debate cannot take place without adequate information), and Regulation/ Management was combined with Reducing Public Choice Distortion to produce a new indicator called Environmental Governance. The result is a structure that gives greater weight to actual environmental performance measures (Environmental Systems, Reducing Stresses, and parts of Global Stewardship), and proportionately less weight to measures of Social and Institutional Capacity.

Within the Global Stewardship component two of the 2001 ESI indicators were combined, and the third indicator was divided in two. The number of indicators, however, remains the same. The Financing International Cooperation indicator was merged into the Participation in International Cooperative Efforts indicator, and variables related to climate change were removed from the Protecting International Commons indicator and placed in a new Greenhouse Gas Emissions indicator so as to assign greater weight to carbon dioxide emissions within the overall ESI. A new indicator was created, termed Reducing Transboundary Environmental Pressures, which measures other stresses on shared environmental resources, including marine fish catch, cross-border flows of sulfur dioxide, and CFC consumption. The 2002 ESI also differs from the 2001 ESI in that we utilized some previously unavailable datasets, and in selected cases we substituted new measures of the same phenomenon if we thought it would improve the overall quality of the ESI. A more detailed description of changes in the ESI methodology can be found at the end of Annex 2.

Challenges to Measuring Environmental Sustainability

Significant methodological challenges face all environmental measurement efforts. In general, the measures of ambient conditions or environmental systems tend to be updated less frequently, have more spotty country coverage, and less precisely match the analytical concepts in question. Stress measures, or emissions of pollutants and other harmful activities, are somewhat better measured, though on a more narrow range of stresses than would be ideal. Finally, socioeconomic factors—such as human vulnerability and social and institutional capacity—are generally measured most frequently and most completely, though even here there are significant gaps.

Detailed discussion of how we selected variables for inclusion in the ESI and what the main strengths and weaknesses of these measure are can be found in Annex 1. Here we summarize some of the most important conclusions concerning the measurement challenge.

Scale Differences

Environmental sustainability is a phenomenon that rarely unfolds at the level of a nation-state as a whole. It is observed more typically at a smaller scale—a river basin, a forest, or an urban center. Yet for the most part, environmental data are reported at the national level. If a country's freshwater withdrawals are about equal to its freshwater availability, for example, then using only national level data will lead one to an optimistic assessment. But if withdrawals are highly concentrated in one area, and availability is concentrated in a different area, these national figures are very misleading. We sought wherever feasible to incorporate data that were collected or reported at a more fine-grained resolution, and then to aggregate them up to national levels in a way that took into account the sustainability dynamics at the smallest relevant scale. We did this for measures of acidification damage, water stress, water quality, air quality, terrestrial systems, and private-sector responsiveness.

It is noteworthy that almost all of these examples of data that were aggregated up from smaller scales came from sources outside the standard canon of international organization data products. For the most part, the standard sources of comparable national environmental data do not lend themselves to such analysis. Of the examples mentioned above, only water quality and air quality came from UN sources; the others were from national labs, university departments, NGOs, or commercial firms. Furthermore, the two UN sources were less than user friendly. The air quality measure was provided for specific cities, and had to be combined with separate data on city population to make it comparable across countries. Even then, the measures were so spotty than such comparisons were problematic. The water quality data were even more difficult to work with. Although they are collected under the auspices of a UN effort, the UN Global Environmental Monitoring System, the data are not released in a usable format except through special arrangement that requires significant compensation to cover processing costs.

Gaps in Data Coverage

Substantive gaps in data coverage were even more problematic. Many important variables had shockingly poor country coverage. Some variables were measured so poorly that we could not use any metric at all in the ESI. This was true for resource subsidies, wetland loss, nuclear reactor safety, and lead poisoning, for example. For two indicators, air quality and water quality, we relied on data sources that had such limited coverage that if it were not for that fact that these measures are so central to environmental sustainability we would have rejected them.

One strategy we used to help deal with data gaps was utilization of modeled data. Increasingly global environmental phenomena are the focus of intensive modeling efforts that take the best available empirical observations as inputs and add tested methods for generating global estimates of either individual variables or the interaction among variables. Such model data are typically far more sensitive to scale and place than conventional sources. The input data are harmonized to make them systematically comparable by teams of substantive experts publishing results in a peer-review process. This data harmonization task is of crucial importance, because to construct a measure relevant to environmental sustainability one must frequently combine information from disparate sources. Without researcher expertise in the subject area, errors are possible (for example, our first effort to measure the percent of mammals threatened had a maximum value of 150 percent because our data for number of mammals present and number of mammals threatened came from different sources; they used incompatible taxonomies, which we realized only because the error in this case was so obvious).

We used model data for water quantity, acidification damage, air pollution emissions, industrial organic pollution emissions, and population stress. We were selective in choosing modeled data; all the models we drew from had been subject to scientific peer review and/or endorsed by international organizations.

In a few select cases, we constructed our own data sets. We did this for environmental health, land area impacted by human activities (jointly with the Wildlife Conservation Society), and membership in international environmental organizations. We also arranged with a few data holders to have custom data sets constructed for us; this was the case with our use of the Innovest EcoValue '21 and Dow Jones Sustainability Group Index variables.

Table 10. Critical sustainability factors for which adequate measures are not available

Desired Variable
Wetland loss
Ecosystem fragmentation
Concentrations and emissions of heavy metals
Concentrations and emissions of persistent organic pollutants
Blood lead levels
Nuclear reactor safety
Levels of natural resource subsidies
Percent of fisheries harvested at unsustainable levels
Land degradation
Recycling rates for major materials
Effectiveness of environmental regulations
Waste disposal impacts

Conclusions and Next Steps

Societies are setting ambitious goals concerning sustainability. The ESI is intended to contribute to the success of these efforts by:

- providing tangible measures of environmental sustainability, filling a major gap in the environmental policy arena;
- making it more feasible to quantify environmental goals, measure progress, and benchmark performance;
- facilitating more refined investigation into the drivers of environmental sustainability, helping to draw special attention to "best practices" and areas of success as well as lagging performance and potential disasters;
- helping to build a foundation for shifting environmental decisionmaking onto a more analytically rigorous foundation;
- offering both aggregate ranking and disaggregated data to calculate environmental analysis at a variety of scales;
- striking a useful balance between the need for broad country coverage and the need to rely on high-quality data that are often of more limited country coverage; and
- building on an easily understood database using a methodology that is transparent, reproducible, and capable of refinement over time.

The Index is not without its weaknesses, however. In particular, the ESI:

- assumes a particular set of weights for the Index's constituent indicators that implies priorities and values that may not be shared universally;
- relies in some instances on data sources of less than desirable quality and limited country coverage;
- suffers from substantive gaps attributable to a lack of comparable data on a number of high-priority issues; and
- lacks time series data, preventing any serious exercise in validation and limiting its value as a tool for identifying empirically the determinants of good environmental performance.

The ESI remains a "work in progress." A number of refinements of the analysis need to be undertaken to deepen our understanding of environmental sustainability and how to measure it. Specifically, we see a need for a number of actions:

1. The world needs a major new commitment to data gathering and data creation. We recommend a pluralistic approach to filling critical data gaps, making use of existing international organizations where they are capable, but filling in where they are not with strategies that draw on networks of scientists, local and regional officials, industries, and nongovernmental organizations.
2. Because there are a variety of value judgments and significant scientific uncertainties about causality, it is necessary to augment the Environmental Sustainability Index with a flexible information system that permits users to apply their own value judgments or to experiment with alternative causal hypotheses. We have tried to advance this objective by experimenting with an interactive version of the Index that operates on a desktop computer and by making our data and methods as transparent as possible. More could be done along these lines, including producing tools to facilitate more powerful integration of environmental sustainability data from different sources.
3. We need more sophisticated methods for measuring and analyzing information that comes from different spatial scales. Environmental sustainability is a function of the interaction of mechanisms that operate at the level of ecosystems, watersheds, firms, households, economic sectors, and

other phenomena that we are not well equipped to understand as parts of a whole. The modest efforts to integrate information from different spatial scales used in this Index need to be evaluated, improved on, and supplemented.

4. Consistent measurements over time are vital to create the ability to carry out robust investigations into cause-effect relationships. These measurements should evolve as data availability and aggregation techniques improve, but they must remain fully transparent and adequately archived for meaningful scientific investigation to be conducted. In addition to continuing measurements into the future, it is possible that retrospective measurements of certain variables could permit more rigorous causal analysis.

End Notes

[1] Prescott-Allen (2001) has achieved a significant advance in this area by setting specific benchmarks against which to rate countries' performance for a wide range issues, from water quality, to fish catches, to resource and energy use. However, many of these benchmarks are established on the basis of normative assertions and "expert" judgment rather than on sound scientific evidence of specific thresholds and their relationship to long-term environmental sustainability.

[2] Some empirical work has begun to address these questions (Frankel and Rose 2002; Harbaugh *et al.* 2000).

[3] The Competitiveness Index is reported as a rank from 1 to 75. For the purpose of this analysis it was converted to a 0-10 scale, with 10 representing the highest rank and 0 the lowest. There are 71 countries in both the Competitiveness Index and the ESI.

[4] These correlations are as follows:

Variable	Correlation	Sig.	N
World Business Council on Sustainable Development Memberships	.476	.000	142
Extent of ISO 14001 Certifications	.482	.000	142
Average EcoValue '21 Ranking of National Firms	.381	.108	19
National Firm Representation in Dow Jones Sustainability Group Index	.378	.036	31

[5] Note that the population density variable used in the ESI is a spatial index created with the Gridded Population of the World data set (CIESIN *et al*., 2000). Each country's territory is classified into 12 population density categories, ranging from completely uninhabited to greater than 50,000 per square kilometer. The index assigns higher scores to countries that have pockets of high population densities than to those whose populations are spread out evenly. The conventional measure of density (total population divided by total area) has a less significant correlation with the ESI and its constituent indicators, and therefore the spatial index was used for purposes of analysis. The Spatial Index of Density variable is available upon request.

References

Center for International Earth Science Information Network (CIESIN), Columbia University; International Food Policy Research Institute (IFPRI); and World Resources Institute (WRI), *Gridded Population of the World (GPW), Version 2*, Palisades, NY: CIESIN, Columbia University, 2000 (available at http://sedac.ciesin.colum-bia.edu/plue/gpw).

Consultative Group on Sustainable Development Indicators, "Dashboard of Sustainable Development Indicators," dataset dated 9 January 2002.

Dixon, Frank, "Financial Markets and Corporate Environmental Results," pp. 44-53 in World Economic Forum, Yale Center for Environmental Law and Policy, and Center for International Earth Science Information Network, *Environmental Performance Measurement: The Global Report 2001-2002*, New York: Oxford University Press, 2002.

Esty, Daniel C. and Peter Cornelius, ed., *Environmental Performance Measurement: The Global Report 2001-2002*, New York: Oxford University Press, 2002.

Esty, Daniel C., and Michael E. Porter, "Ranking National Environmental Regulation and Performance: A Leading Indicator of Future Competitiveness?" pp. 78-101 in World Economic Forum (WEF), *The Global Competitiveness Report 2001,* New York: Oxford University Press, 2001.

Flatz, Alois, "Corporate Sustainability and Financial Indexes," pp. 66-81 in Daniel C. Esty and Peter Cornelius, ed., *Environmental Performance Measurement: The Global Report 2001-2002*, New York: Oxford University Press, 2002.

Frankel, Jeffrey, and Andrew Rose, "Is Trade Good or Bad for the Environment? Sorting out the Causality," (unpublished manuscript, 2002).

Harbaugh, William, Arik Levinson and David Wilson, "Reexamining the Empirical Evidence for an Environmental Kuznets Curve," National Bureau of Economic Research Working Paper No. w7711, May 2000.

Levy, Marc A. "Corruption and the 2001 Environmental Sustainability Index," pp. 300-302 Robin Hodess, ed., *Global Corruption Report 2001,* Berlin: Transparency International, 2001.

Levy, Marc A., "Measuring Nations' Environmental Sustainability," pp. 12-23 in Daniel C. Esty, and Peter Cornelius, ed., *Environmental Performance Measurement: The Global Report 2001-2002*, New York: Oxford University Press, 2002.

Parris, Thomas M. and Robert W. Kates, "Characterizing a Sustainability Transition: The International Consensus," paper prepared for presentation at the Open Meeting of the Human Dimensions of Global Environmental Change Research Community, 7 October 2001, Rio de Janeiro, Brazil.

Porter, Michael, "America's Green Strategy," *Scientific American*, August 1991.

Prescott-Allen, Robert, *The Wellbeing of Nations*, Washington, DC: Island Press, 2001.

Schiller, Andrew, *Signatures of Sustainability: A Framework for Interpreting Relationships Among Environmental, Social, and Economic Conditions for United States Metropolitan Areas*. Dissertation, Clark University, 2001. Ann Arbor: UMI, AA13003109.

United Nations, Economic and Social Council, "Implementing Agenda 21: Report of the Secretary General," E/CN.17/2002/PC.2/7, 20 December 2001.

World Economic Forum (WEF), *The Global Competitiveness Report 2001-2002,* New York: Oxford University Press, 2002.

Annex 1. Evaluation of the Variables

In this annex we discuss how we approached the selection of variables and share our conclusions concerning available data. A high-level summary is found in Table A1.1. We have characterized each variable according to its coverage, or the extent to which they provide measures for the 142 countries in the ESI. We set a high standard here because the ESI country set is already truncated. Approximately 50 countries have been removed largely for reasons of poor data availability. Recency refers to the degree to which the variables are updated in a timely manner. Relevance connotes the extent to which the variable corresponds to the phenomenon – variables with high relevance measure precisely the dimension of environmental sustainability as defined by the indicator in which it is placed, while the variables with lower relevance are best thought of as proxies. The concentration of ambient air pollutants (the SO_2, NO_2, and particulate measurements used in the ESI) are examples of variables with high relevance, while the extent of ISO 14001 certification is a clear example of a proxy variable for private sector responsiveness.

For each variable, complete source information and data values can be found in Annex 6.

For a related review of sustainability indicator data, see United Nations (2001).

Table A1.1 Evaluation of the 2002 ESI Variables

Indicator	Variable	Coverage	Recency	Relevance	Comments
Air Quality	Urban SO2 concentration	Poor (36%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
	Urban NO2 concentration	Poor (36%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
	Urban TSP concentration	Poor (34%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
Water Quantity	Internal renewable water per capita	Excellent (100%)	Good	Extremely high	Modeled data of high quality.
	Per capita water inflow from other countries	Excellent (99%)	Good	Extremely high	Modeled data of high quality.
Water Quality	Dissolved oxygen concentration	Poor (36%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
	Phosphorus concentration	Poor (34%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
	Suspended solids	Poor (29%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.
	Electrical conductivity	Poor (29%)	Fair	Very high	Data are from specific monitoring stations that are not selected according to consistent criteria. Three-year lag in reporting.

Indicator	Variable	Coverage	Recency	Relevance	Comments
Biodiversity	Percentage of mammals threatened	Excellent (99%)	Excellent	Moderate	Measures species diversity; does not measure habitat or genetic diversity.
	Percentage of breeding birds threatened	Excellent (97%)	Excellent	Medium	Measures species diversity; does not measure habitat or genetic diversity.
Land	Percent of land area having very low anthropogenic impact	Excellent (100%)	Good	Adequate	Assesses extent of human-altered landscapes; does not measure land degradation. Some input data are dated.
	Percent of land area having high anthropogenic impact	Excellent (100%)	Good	Adequate	Assesses extent of human-altered landscapes; does not measure land degradation. Some input data are dated.
Reducing Air Pollution	NOx emissions per populated land area	Excellent (98%)	Excellent	Fair	For most countries only model scenario data are available.
	SO2 emissions per populated land area	Excellent (99%)	Excellent	Fair	For most countries only model scenario data are available.
	VOCs emissions per populated land area	Excellent (98%)	Excellent	Fair	For most countries only model scenario data are available.
	Coal consumption per populated land area	Excellent (100%)	Excellent	Medium	Based on reliable data. Does not distinguish among different methods of coal combustion.
	Vehicles per populated land area	Very good (94%)	Very good	Medium	Includes cars, buses and freight vehicles.
Reducing Water Stress	Fertilizer consumption per hectare of arable land	Excellent (99%)	Very good	High	Does not account for agricultural practices (e.g. protected riparian zones).
	Pesticide use per hectare of crop land	Good (64%)	Very good	High	Does not account for agricultural practices (e.g. protected riparian zones).
	Industrial organic pollutants per available fresh water	Fair (49%)	Very good	Extremely high	Limited to organic pollutants.
	Percentage of country's territory under severe water stress	Excellent (98%)	Good	Extremely high	Modeled data of high quality.
Reducing Ecosystem Stresses	Percentage change in forest cover 1990-00	Excellent (100%)	Excellent	Medium	Relies on a sampling technique that can under or over-estimate deforestation. Assumes all reduction in forest cover is equally harmful to environment.
	Percentage of county with acidification exceedence	Excellent (100%)	Fair	Medium	Conceptually good measure of ecosystem stress, but relies on model estimates for most countries.
Reducing Waste & Consumption Pressures	Ecological footprint per capita	Excellent (99%)	Good	High	Good measure of consumption, but arbitrary weighting of consumption impacts.
	Radioactive waste	Poor (31%)	Good	Medium	Does not reflect differences in how the waste is handled.
Reducing Population Growth	Total fertility rate	Excellent (100%)	Excellent	High	Based on survey data and vital statistics that are reliable and accurately measured.
	Percentage change in projected population between 2001 & 2050	Excellent (100%)	Excellent	High	Based on assumptions that underlie the population projections.

Indicator	Variable	Coverage	Recency	Relevance	Comments
Basic Human Sustenance	Proportion of undernourished in total population	Very good (96%)	Very good	Adequate	Based on survey data. Much variance not connected to environmental conditions. An ideal measure would link food insecurity to environmental conditions.
	% of population with access to improved drinking-water supply	Very good (78%)	Excellent	Low	This variable does a poor job at tracking differences in availability of adequate drinking water.
Environmental Health	Child death rate from respiratory diseases	Poor (38%)	Fair-very good	High	Not all respiratory diseases are environmentally related; countries do not report data using consistent methods and criteria.
	Death rate from intestinal infectious diseases	Fair (45%)	Fair-very good	High	Not all intestinal infectious diseases are environmentally related; countries do not report data using consistent methods and criteria.
	Under-5 mortality rate	Excellent (99%)	Excellent	Adequate	Based on vital statistics that are reliable and accurately measured, but not all mortality is environmentally related. More reliable than disease-specific death rates.
Science/Tech.	Technology achievement index	Fair (48%)	Excellent	Medium	Measures ability to produce economically useful technological innovations; a proxy for ability to assess and respond to technical challenges wrought by environmental change.
	Innovation index	Fair (45%)	Excellent	Medium	Measures ability to produce economically useful technological innovations; a proxy for ability to assess and respond to technical challenges wrought by environmental change.
	Mean years of schooling (age 15 and above)	Good (69%)	Excellent	Adequate	Based on educational statistics that are reliable and accurately measured. Does not directly measure ability to assess and respond to technical challenges wrought by environmental change.
Capacity for Debate	IUCN member organizations per million population	Excellent (100%)	Excellent	Adequate	The total number of environmental NGOs would be preferable, but is unavailable. This does not address effectiveness or representativeness of NGOs.
	Civil & political liberties	Excellent (99%)	Excellent	High	This relies on qualitative assessments and survey data.
	Democratic institutions	Very good (94%)	Excellent	Medium	This relies on qualitative assessments.
	Percentage of ESI variables in publicly available data sets	Excellent (100%)	Excellent	High	Some countries collect good data but do not report them to global sources; others collect problematic data but report them regularly.

Indicator	Variable	Coverage	Recency	Relevance	Comments
Environmental Governance	Regulatory rigor	Fair (50%)	Excellent	Adequate	Based on survey of opinion leaders with limited country coverage; not independently corroborated.
	Percentage of land area under protected status	Excellent (100%)	Good	Adequate	This data set has inconsistencies and irregularities.
	Number of sectoral EIA guidelines	Fair (41%)	Very good	Adequate	The percent of projects utilizing environmental impact assessment would be preferable. This does not assess effectiveness of the EIA process.
	FSC accredited forest area as a percentage of total forest area	Excellent (100%)	Excellent	Medium	Does not measure non-FSC accredited forests that are sustainably managed.
	Control of corruption	Very good (94%)	Excellent	High	High correlation with overall environmental performance.
	Reducing market externalities (ratio of gasoline price to international average)	Very good (96%)	Excellent	Adequate	Lower gasoline prices are proxy for degree to which governments adjust for market externalities.
	Subsidies for energy or materials usage	Fair (50%)	Excellent	Adequate	Based on survey of opinion leaders with limited country coverage.
	Subsidies to the commercial fishing sector	Poor (22%)	Very good	Adequate	WWF experienced problems obtaining and analyzing the patchy data in this area.
Private Sector Responsiveness	Number of ISO14001 certified companies per million $ GDP	Excellent (100%)	Excellent	Adequate	Many countries have their own standards that are equal or superior to the ISO standards.
	Dow Jones Sustainability Group Index	Poor (22%)	Excellent	High	Very limited company and country coverage.
	Average Innovest EcoValue rating of firms	Poor (14%)	Excellent	High	Very limited company and country coverage.
	World Business Council for Sustainable Development members	Excellent (100%)	Excellent	Adequate	Proxy for corporate concern for environmental sustainability.
	Private sector environmental innovation	Fair (50%)	Excellent	Adequate	Based on survey of opinion leaders with limited country coverage.
Eco-efficiency	Energy efficiency (total energy consumption per unit GDP)	Very good (91%)	Excellent	Extremely high	Based on reliable data.
	Renewable energy prod. as a percentasge of total energy consumption	Excellent (100%)	Excellent	High	Based on reliable data.

Indicator	Variable	Coverage	Recency	Relevance	Comments
Participation in Int'l Collaborative Efforts	# of memberships in environmental intergovernmental orgs.	Excellent (99%)	Very good	Adequate	Does not gauge level of engagement within organizations. Update not planned.
	Percentage of CITES reporting requirements met	Excellent (100%)	Excellent	Adequate	Does not measure substantive species protection or enforcement of trade prohibitions.
	Levels of participation in the Vienna Convention/Montreal Protocol	Excellent (100%)	Excellent	Adequate	A process rather than a substantive measure.
	Levels of participation in the Climate Change Convention	Excellent (100%)	Excellent	Adequate	A process rather than a substantive measure; very little cross-national variation.
	Montreal protocol multilateral fund participation	Excellent (100%)	Excellent	High	Clear, objective measure of commitment to managing ozone-depletion problem; may not be representative of global problems in general.
	Global environmental facility participation	Excellent (100%)	Excellent	Adequate	Does not account for other means of financing international environmental issues.
	Compliance with Environmental Agreements	Fair (50%)	Excellent	Adequate	Based on survey of opinion leaders with limited country coverage.
Reducing Greenhouse Gas Emissions	CO_2 emissions per capita	Excellent (100%)	Very good	Extremely high	Based on reliable data. There is strong consensus that sustainability requires lower CO_2 emissions per capita.
	Carbon efficiency (CO_2 emissions per dollar GDP)	Excellent (98%)	Very good	Extremely high	Based on reliable data. There is strong consensus that sustainability requires breaking link between economic growth and CO_2 emissions.
Reducing Transboundary Environmental Pressures	CFC consumption (total times per capita)	Very good (76%)	Very good	Extremely high	Based on reliable data. CFC consumption directly harms global commons.
	SO2 exports	Poor (40%)	Very good	High	Only available for Europe and East Asia.
	Total marine fish catch	Very good (76%)	Excellent	Adequate	Does not differentiate among healthy and endangered stocks.
	Seafood consumption per capita	Excellent (98%)	Excellent	Adequate	An imperfect measure of overexploitation of the resource.

Environmental Systems

The environmental systems component represents the current status of a nation's biophysical environment. This component is comprised of five indicators: air quality, water quality, water quantity, biodiversity and land. This grouping of indicators draws on relatively standard data sets. It is similar to other indicator efforts, including the the Ecosystem Well-being Index and the Commission on Sustainable Development's indicator set. The following sections describe each indicator, highlighting the strengths and weaknesses of the variables available to measure them and pointing out areas for possible improvement.

Air Quality

Description: Ambient air quality is a critical factor in determining the condition of an environmental system; both the natural and the human world are dependent on the surrounding atmosphere. The ESI incorporates measures of urban air quality using three concentration variables: sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and total suspended particulates (TSP). The European Commission and U.S. local and federal agencies use these same indicators.

Strengths: All three variables gauge ambient air quality. Because natural background levels of these pollutants are low, deviations from baseline can be attributable to anthropogenic emissions. All three variables covered are hazardous to human health. Sulphur dioxide and nitrogen dioxide are also harmful to flora and fauna. Dominant SO_2 sources are industrial activities (e.g., iron ore smelting) and fossil fuel combustion (e.g., electricity generation). Dominant sources of NO_2 are high temperature fossil fuel combustion in processes such as electricity generation and motor vehicles.

Weaknesses: There are no comprehensive collections of comparable air quality data. The Global Environmental Monitoring System (GEMS) attempts to collect such data, but most countries do not participate in GEMS. Even among the 61 countries that report some air quality values to GEMS, there is no consistency in how the monitoring stations are selected, making it difficult to generate national comparisons. As a result, what we have available is, on the one hand, a sparse global collection, and on the other hand, a complex collection of national, regional, and local monitoring efforts that are by and large not comparable to one another.

It is technically possible to generate more comprehensive and more up-to-date national air quality estimates utilizing a combination of global air quality models, integration of monitoring data from more diverse sources, and creative expansion of monitoring programs to help fill critical observational gaps. Global models are critical to permit the integration of disparate observational data in an internally consistent manner. For descriptions of leading global air quality modeling work, see the papers at http://www.ciesin.columbia.edu/pph/-papers.html.

Water quantity

Description: The availability of water for human uses such as drinking water, agriculture and industry, as well as for ecosystem preservation, is one of the most fundamental aspects of sustainability. As seen starkly in the case of the Aral sea, where large-scale water withdrawals from rivers feeding the sea led to a decline in water levels of several meters, over abstraction of water resources can have catastrophic results across all these dimensions.

The ESI uses data from the University of Kassel's WaterGAP 2.1 model, which is in the form of a comprehensive, internally consistent, spatially referenced measure of water availability (Alcamo *et al.* 2000). The data are in gridded form, which is aggregated to national boundaries.

Strengths: The comprehensiveness and internal consistency of the WaterGAP data are among its key strengths. It guarantees that no two countries are counting the same water resources toward their national total, which is possible in measures that rely on separately submitted national reports. Another crucial advantage is that it permits spatially precise cross-reference with consumption patterns, making it possible to generate a far more useful measure of water stress than would otherwise be possible.

Weaknesses: Built on a half-degree grid cell size, the WaterGAP data do not permit accurate estimates of small countries. The data are not updated on a regular basis. The most recent data set is a 1995 estimate based on a 30-year rainfall and evapotranspiration average (1960-1990).

Water quality

Description: The ESI water quality indicator is designed as a measure the health of ambient water quality in inland aquatic systems. Four variables comprise this indicator: dissolved oxygen, phosphorous concentration, turbidity and electrical conductivity. While all the variables used are relative to specific systems, dissolved oxygen and phosphorous have less natural variability than the other two. Conceptually, this indicator works well, but limited data severely handicap our ability to represent a country's ambient water quality.

Strengths: The variables themselves are commonly used indicators of water quality. Dissolved oxygen is measure of oxygen-demanding waste. Phosphorus concentration is a measure of contamination by this pollutant. Suspended solids are a measure of turbidity or water clarity. Impacts from high turbidity levels include low light penetration and negative impacts on fish health.

Weaknesses: As with the air quality measures, the primary limitation of these measures is the absence of a comprehensive global data set. Only about 30 percent of the ESI countries participate in the Global Environmental Monitoring System (GEMS), which is the only effort to produce a global data collection on water quality. There are no consistent criteria for choosing the location of GEMS stations, and therefore it is difficult to extrapolate from the site-level data to a national aggregate.

Refinements might include accounting for natural variations in some of the variables, such as dissolved oxygen and electrical conductivity. Variations in temperature, salinity and pressure, all affect dissolved oxygen concentration. There is a considerable amount of natural variability in both suspended solids and electrical conductivity. Electrical conductivity is also high impacted by geology and watershed size.

It would be useful to have data on several addition variables: (1) fish advisories, (2) wetlands loss, and (3) urban runoff potential. Fish advisories are issued due to the bioaccumulation of toxic substances in fish and shellfish, and thus would represent a proxy measure of water quality. Wetlands make important contributions to the health of aquatic systems in a watershed by purifying water, filtering runoff, abating floods, and decreasing erosion. Wetland loss rates could make an important contribution to this indicator, were the data available. Urban runoff potential, as measured by impervious surface area near water bodies, would help quantify the impact of land development on aquatic systems.

Biodiversity

Description: The ESI biodiversity indicator is composed of two variables describing the number of known species that are endangered or threatened in two categories of species for which data is available. Both measures derive from the IUCN "Red List." A threatened species is one that has become more rare and could face extinction if trends are not reversed. Typical causes of species loss include pollution, harvesting or hunting, and habitat loss.

Strengths: The variables used, percent of known mammals threatened and percent of breeding birds threatened, are reasonable proxies for species more generally. Both data sets are considered reliable by conservation biologists.

Weaknesses: The ESI biodiversity indicator measures current mammal and avian species diversity, but does not have information on fish, reptiles, amphibians and insects, nor on alternative measures such as species richness or genetic diversity. These other measures would permit more robust national comparisons, but there are no reliable measures of them.

Because mammals and birds are not as widespread as amphibians and insects, the ESI's biodiversity indicator is vulnerable to distortions among countries that have very small numbers of such species (Haiti has only 4 mammals, for example). In these countries a small difference in the number of endangered species makes a big difference in the percentage.

Land

Description: The health of terrestrial ecosystems is notoriously hard to measure, yet fundamentally critical to environmental sustainability (National Research Council 2000). Prior versions of the ESI used the Global Assessment of Human Induced Soil Degradation (GLASOD) data measuring anthropogenic land degradation. This data set is no longer used in the ESI. It was dropped due to the fact that it is out-of-date, and because of concerns regarding the validity of the data (some efforts to ground-truth the GLASOD data found major discrepancies).

Under the circumstances, we have used a more reliable, though less comprehensive, measure of terrestrial systems. This measure was developed jointly by the Wildlife Conservation Society (WCS) and CIESIN to quantify the impact of human activity on the Earth. This was accomplished by combining layers of information on land cover, population density, stable "lights at night" and human infrastructure in a geographic information system. The result was a "wilderness index," on a one-kilometer scale. Two separate thresholds were applied to this index to create the two variables included in the ESI land variable, one identifying areas of low anthropogenic impact and one identifying areas of high anthropogenic impact.

Strengths: This dataset uses objective information on readily observable phenomena, using a reproducible methodology, to quantify the extent of human impact on the land. It is relatively simple to update on an ongoing basis.

Weaknesses: The primary weakness of this indicator is that it measures only the grossest aspect of human impacts on the land. It does not measure ecosystem fragmentation; it does not measure the health of specific ecosystems such as wetlands, forests or savannah; it does not take into account variation in the health of different agricultural systems.

The Millennium Ecosystem Assessment, a US$24 million multi-agency project to be completed in 2005, promises to help fill some of the important data gaps (see http://www.ma-secretariat.org/en/about/concept.htm).

Reducing Environmental Stresses

This component focuses on the threats posed to the environment by human activities. It covers both pollution and exploitation. It is designed to gauge the efforts of a nation to reduce such stresses. It includes five indicators: Reducing Air Pollution, Reducing Water Stress, Reducing Ecosystem Stress, Reducing Waste and Consumption Pressure, and Reducing Population Growth. The following section describes each indicator, highlights the strengths, and lists possible areas for improvements.

Reducing Air Pollution

Description: This indicator includes a set of variables that directly affect both ecological resources and human health: sulphur dioxide (SO_2), nitrogen oxides (NO_X), non-methane volatile organic compounds (VOCs), coal consumption, and vehicle density. All five variables have been normalized by populated land area (land area populated at 5 or more persons per square kilometer), based on the assumption that emissions are higher in densely populated areas.

Strengths: All the five variables represent a good measure of air pollution. SO_2 and NO_X are among the anthropogenic pollutants that contribute to acid rain and affect forests, soil and aquatic habitats, as well as the main determinants of urban air quality. SO_2 and NO_X are produced mainly by industrial activities and fossil fuel combustion. VOC emissions derive mainly from the incomplete combustion of fuels or the evaporation of fuels, lubricants and solvents, and contribute mainly to photochemical smog.

SO_2, NO_X, and VOC emissions are calculated using IPCC Special Report on Emission Scenarios (SRES) gridded data. The use of gridded data gives more detailed information about the distribution of pollution sources and permits a better estimate of total emissions within each country. The SRES data has the advantage of having estimates for the year 2000, whereas other global emission grids are all referenced to 1990 values. Because many countries have experience large changes in emission levels over the past decade, we chose the SRES data.

Coal consumption is a good proxy for air pollution: coal fired power plants emit SO_2 and other air pollutants (as well as CO_2, the primary greenhouse gas). Vehicle density is also used as a proxy for air pollution. These proxies are used to help redress shortcomings in the gridded emissions data. Because they are measured reliably and comprehensively, they help make the indicator more reliable overall.

Weaknesses: The cell size for the SO_2, NO_X and VOC emission datasets is 1 degree latitude by 1 degree longitude, which makes it difficult to generate reliable estimates for small states, and poses difficulties when national borders straddle grid boundaries. We have sought to minimize these difficulties by substituting national emission data from the European Monitoring and Evaluation Program (EMEP) where available (World Resources 2000).

The sustainability indicator community ought to make as a priority the creation of up-to-date, comprehensive national emissions inventories for the most fundamental pollutants (in addition to SO_2, NO_x and VOCs, inventories of particulate emissions would be valuable). Reliable emissions inventories are already available for Europe, North America and East Asia, but data from these regions have not been integrated and checked for consistency.

Poor data availability on lead concentration in gasoline had led us to exclude this potentially useful variable form the ESI. Efforts will be made in the future to look for better source data on this critical environmental threat.

Airborne emissions of other pollutants, especially complex organic chemicals, would be extremely useful within this indicator, yet the available cross-national data are very poor. We examined some national inventories of persistent organic pollutants, which have assumed increased salience in light of the recent treaty restricting their use, but found their coverage too spotty to be useful.

Reducing Water Stress

Description: Because of the importance of water to a whole range of environmental processes, and because of its crucial role in agriculture and industrial processes, how a country affects its water resources is arguably the single most important indicator of its environmental sustainability. This indicator addresses the ability of a nation to minimize threats to water quality, including intensive use of agricultural fertilizers and pesticides, industrial waste, and sewage pollution. Four variables are included: fertilizer consumption per hectare of arable land, pesticide use per hectare of cropland, industrial organic pollutants per available freshwater, and percentage of a country's territory under severe water stress.

Strengths: The set of variables included in the water stress indicator is representative of indicators widely used to assess threats to water quality (e.g., CSD Working List of Indicators of Sustainable Development, Wellbeing Index, Report of Water Quality in the European Union, etc.). These variables are recognized as effective measures of the stress on water quality and aquatic ecosystems.

Although fertilizers and pesticides provide useful services to agriculture, they pollute water resources. These variables are well documented and data are widely available for many countries.

The percentage of a country under severe water stress captures the percent of the territory that is withdrawing significantly more water from available resources than the amount being replenished. This variable has been calculated using the WaterGAP 2.1 model, developed at University of Kassel. The advantage of the model is that the data are available on a grid basis, which allows assessment of water stress at more precise levels of resolution. In some countries, total water withdrawals are approximately equal to total availability, even though there are regions of extreme water scarcity relative to demand.

Weaknesses: Country coverage on water pollution is only fair. Less than 50 percent of the countries report Biochemical Oxygen Demand (BOD) values, and about 64 percent report pesticide use.

Pesticide use and fertilizers consumption are collected at the country level, in a manner that does not take into account soil conditions, compound mobility and level of persistence. In order to get even more valuable information, data should be collected at single point stations and then aggregated, taking into account agricultural zones and toxicity and persistence variations.

Reducing Ecosystem Stress

Description: This indicator takes into account two variables that express stress on ecosystem health: deforestation and acidification. Specifically the two variables included are: percent of forest cover change and percent of a country with acidification exceedance.

Strengths: Deforestation and acidification negatively affect ecosystem health and severely limit the ability to preserve natural ecosystems intact. Deforestation contributes to species loss, soil erosion, diminished water quality, and loss of natural hazard buffering. A major reassessment of deforestation was recently concluded (the FAO Forest Resources Assessment 2000), generating more up-to-date and more sophisticated measurements. Acidification contributes to species loss and overall loss of ecosystem health. Acidification exceedance is an especially useful measure because it takes into account the interaction between the acidifying deposition and the sensitivity of the soil to acidification (Kuylenstierna *et al.* 2001). Such interaction is vital to understanding long-term sustainability.

Weaknesses: A technical report by the World Resources Institute (Matthews 2001) comments on the methodology and the findings of the FAO Forest Resources Assessment 2000. It highlights inconsistencies of the original data and questions the quality and the reliability of the data. Another downside of this variable is that, although it provides national estimates, it lacks information about the spatial distribution of the forests and the level of fragmentation. Forest fragmentation might be a more important measure of forest ecosystem health than the total area deforested. However, measures of forest fragmentation are difficult to obtain.

These criticisms notwithstanding, additional investment in measuring deforestation is probably not justified. Other measures of ecosystem stress are more important but far more neglected. Global deforestation became the focus of intense measurement efforts because it became extremely politicized during the 1980s. But wetland loss (subject to less political posturing) matters at least as much as deforestation but is not well measured.

The country coverage for acidification exceedance is very good, but the values are calculated for the year 1990 using model estimates. High quality, validated data are available only for Europe and East Asia.

Reducing Waste and Consumption Pressure

Description: This indicator focuses on the pressure stemming from resource consumption and waste generation. Two variables are included: Ecological Footprint per capita and radioactive waste.

Strengths: The Ecological Footprint per capita is a highly aggregated measure that takes into account a broad range of consumption pressures. The footprints, as calculated by Redfining Progress (Wackernagel *et al.* 2001), compare consumption of natural resources in each country with the biosphere's ecological capacity. The Ecological footprint also reflects population size, average consumption per person, and the resource intensity of the technology used.

Radioactive waste represents a potential hazard to human health and contributes in a very significant way to increasing pressure on the environment. Despite the poor country coverage, the quality of the data, in terms of source and relevance for inclusion in the ESI, is excellent. The original data were obtained from the International Atomic Energy Agency (IAEA) Waste Management Database (Report 9.1), as accumulated quantity of short-lived waste. The IAEA also sets the safety standards applicable to management of radioactive waste.

Weaknesses: This indicator is weak on industrial waste, which has the potential to inflict as much (or more) harm as the broad consumption pressures captured in the Ecological Footprint. We would like to include data on waste recycling and waste disposal, for example, and information on nuclear reactor safety. Unfortunately, such data are rarely available, and when they are the country coverage is very limited.

Another area of improvement would be to increase the country coverage for the radioactive waste variable. Currently only 31 percent of the nations included in the ESI have data for Radioactive Waste. An updated Waste Management Database Report will be available by April 2002 and will be included in the future ESI.

Reducing Population Growth

Description: Population growth is an important stress. Although it is true that the relationship between population and environment is complex, it is generally agreed that, other things being equal, each additional increment in population increases stress on the environment. This indicator attempts to quantify that stress, using two variables: total fertility rate and projected change in Population between 2001 and 2050. Total fertility rate (TFR) measures the average number of children born per woman. The projected change in population takes into account fertility and mortality levels, as well as immigration and emigration.

Strengths: The variables included in this indicator capture the concept of stresses in terms of population growth well. This is a robust indicator, with reliable data and good country coverage. The variables are widely used in other indicator efforts.

Fertility contributes the most, over the long-term, to population growth. High fertility is not environmentally unsustainable in the long run. This measure has been supplemented with projected change in population between 2001 and 2050 because it provides a better indication of the trajectory of population change, which has an impact on a nation's per capita natural resource availability and environmental conditions.

Reducing Human Vulnerability

This component seeks to measure the interaction between humans and their environment, with a focus on how human livelihoods are affected by environmental change. The component includes two indicators: Basic Human Sustenance and Environmental Health.

Basic Human Sustenance

Description: Food and basic services (such as water and sanitation) are essential for health and survival. The two variables included in this indicator are:the proportion of undernourished in the total population and percentage of population with access to improved drinking water supply.

Strengths: Although the 2001 ESI utilized another measure of food security – calorie supply as a percentage of total requirements – unfortunately it is no longer routinely calculated. Therefore we now use the commonly available measure "proportion of undernourished in the total population" which provides a good measure of sufficiency of food intake in order to meet dietary energy requirements. The core idea here is that nations that wish to maintain long-run environmental sustainability must find effective strategies to provide for the nutritional needs of their populations.

The water supply figures are based on a major improvement of the global water supply data coordinated by the UNICEF-WHO Joint Monitoring Program. These data are of good quality, though they do not perfectly reflect differences in all of the important underlying water issues.

Weaknesses: The proportion of undernourished in total population is based on FAO estimates, which are generally reliable. Nonetheless, the FAO did not cite specific figures for countries with less that 2.5 percent undernourished. Therefore we assigned a value of 1 percent to those countries in which undernourishment is generally very rare.

Access to improved drinking-water supply is estimated using technology as an indicator. Definitions of "improved" technologies are based on the assumptions that certain technologies (e.g., boreholes and pumps) are better for health than others (e.g., collection from open water sources such as rivers and lakes). These assumptions may not be true in all individual cases. Definitions of services in the household surveys vary between surveys and over time, making difficult comparisons even within the same country. Furthermore, the report uses nationally consolidated data, which do not account for variations within a country. A better measure of the adequacy of water supply would take into account the suitability of the water available to households, including both *accessibility* and *quality*.

Environmental Health

Description: This indicator comprises variables related to the effects of environmental conditions on overall population and children. It includes: child death rate from respiratory diseases, death rate from intestinal infectious diseases and under-five mortality rate. Respiratory disease death rates are calculated only for children because among adults lifestyle and occupational factors play a major role in mortality rates, whereas among children environmental effects predominate. In contrast, environmental conditions (especially water quality) play a major role among all age groups in intestinal infectious diseases.

Strengths: The major strengths of this indicator relate to the development of two variables specifically designed by the ESI team to capture the concept of environmentally related disease. The development of the child death rate from respiratory diseases and death rate from intestinal infectious diseases variables represent the first concrete effort to produce indicators that are attributable to environmental conditions (World Economic Forum 2001).

The under-five mortality rate is used because children under the age of five are generally more susceptible to water-borne and respiratory diseases, which translates into higher mortality rates in countries where water and air quality are poor. Under-five mortality is reported more reliably than the disease-specific mortality rates. Although it reflects problems broader than environmental health issues (such as poverty and public health infrastructure), it is more comprehensive and consistent than the disease-specific measures, and is therefore a useful addition to this indicator.

Weaknesses: Although we attempted to narrow the focus to diseases that are most directly related to environmental conditions, not all of these deaths are attributable to environmental conditions. Most countries do not report mortality data with enough precision to permit a comprehensive comparison.

Social and Institutional Capacity Component

Because environmental sustainability is a phenomenon that emerges over the long run, and because challenges to environmental sustainability are multifaceted and hard to predict, it is critical to include measures of nations' capacity to understand and respond to unfolding environmental dynamics. Where such capacity is high, we expect more favorable long-run environmental conditions.

Science/Technology

Description: This indicator is intended to measure a country's level of scientific and technological capacity to address environmental challenges. Although there are measures of the number of scientists per capita and scientific publications per capita, we found these measures deficient in coverage and quality and no longer use them in the ESI. Instead we rely on three measures: the Human Development Report's Technology Achievement Index, an Innovation Capacity Index created by Porter and Stern (2001), and the average years of schooling among the population over age 15.

Strengths: The Technology Achievement Index and the Innovation Capacity Index come closest to measuring the ability to understand and respond to unfolding environmental challenges. They take into account empirical measures of innovations (such as patents) as well as broader conditions that affect innovation. However, they do not have good country coverage; the average years of schooling has better coverage, and is more readily estimated for countries lacking coverage.

Weaknesses: The primary difficulty of this indicator is that there are currently no data that specifically measure scientific and technological capacity to attain environmental sustainability *per se*. Technology is a double-edged sword, and the same technologies that can be used to protect the environment (e.g., computers, information systems, remote sensing, etc.) can be used to the detriment of the environment and natural resources. Furthermore, measures of the application of appropriate technologies (such as sustainable farming or resource management technologies, or improved health and sanitation technologies) are unavailable.

Capacity for Debate

Description: The ability to craft well-designed policies in the environmental sphere depends on the availability of environmental information, the degree to which competing views are aired, and the existence of structures that allow compromises to be reached among stakeholders (OECD 2001, p. 255; Access Initiatve 2001). This indicator measures these features. Variables include the existence of civil and political liberties, the presence of democratic institutions, the degree to which important environmental issues are debated by a society, and whether or not information is available to support decision-making.

Strengths: Variables that measure democratic institutions and civil and political liberties are robust and provide a reasonably accurate picture of a country's openness to debate and to the participation of citizens in important decisions. They are also frequently updated.

Weaknesses: This indicator is missing variables that specifically measure the public's right to information, including information about infrastructure projects and broad environmental decisions.

We have attempted to capture the availability of environmental information by measuring a country's representation in public environmental data sets (e.g., water quality, air quality, biodiversity loss, and pollutant emissions). This is at best a proxy for what we would like to be able to measure: (a) the extent and quality of environmental monitoring and data collection efforts, and (b) the availability and accessibility of data and information on the environment at national and sub-national scales through government agencies, libraries, and internet sources.

Environmental Governance

Description: Environmental governance is defined as the institutions, rules and practices that shape responses to environmental challenges. This indicator is measured with the following variables:

- quality of environmental regulations
- existence of sectoral guidelines for environmental impact assessments
- degree of transparency in environmental decision-making, and absence of corruption
- extent of protected areas, and degree of certification of forest areas for sustainable management
- existence of subsidies that may lead to over-exploitation of resources

Strengths: We sought to quantify as much as possible issues of governance that are directly relevant to environmental sustainability. The variables, a mixture of survey and qualitative data, observations and calculations, do a reasonably accurate job of capturing environmental governance.

Weaknesses: These measurements rely heavily on survey data, which are vulnerable to bias. It would be preferable to have more objective data concerning the stringency and effectiveness of environmental regulations (e.g., percentage of environmental regulatory violations that are prosecuted).

It was especially disappointing not to be able to use more complete data on natural resource subsidies. We did include a measure of subsidies to the fisheries sector that was laboriously compiled by the World Wildlife Fund (U.S. branch of the World Wide Fund for Nature; WWF 2001). The challenges WWF encountered in compiling the fisheries subsidies data is an object lesson in how difficult it is to determine the extent of subsidies in any given sector. This is largely because subsidies take many different forms, including credit support programs, tax preferences and insurance support, capital and infrastructure supports, and marketing and price supports. Moreover, many governments actively seek to conceal such subsidies.

Developing national measures of resource subsidies in the areas of forestry, agriculture and water would dramatically improve our ability to measure environmental governance.

The data on protected areas are widely used in indicator efforts such as ours, but have limitations. They provide little comparative information on the stringency or effectiveness of the protected areas, and the degree to which data are complete varies considerably from country to country, making comparisons problematic.

Private Sector Responsiveness

Description: Measures of private sector responsiveness are included out of a realization that private sector activity has a big influence on the environment and on our ability to manage environmental challenges effectively. Additionally, the degree to which the private sector is usefully responding to the challenges of environmental sustainability varies from country to country. The variables included in this indicator are drawn from surveys, independent corporate ratings, and participation in relevant international efforts to promote environmental best practices. They include: number of ISO14001 certified companies per million dollars GDP, Dow Jones Sustainability Group Index, Average Innovaest EcoValue rating of firms, World Business Council for Sustainable Development members, and survey responses to questions concerning private sector environmental innovation.

Strengths: The strength of this indicator is its use of a range of variables that, in combination, permit quantitative measures of private sector responsiveness to environmental challenges for each country. This constitutes a novel contribution to the sustainability indicator field.

Weaknesses: There are three main weaknesses with these measures. First, the highest quality data are concentrated in the smallest number of countries, limiting our ability to generalize reliably across the globe. For example, the data from two investment advisory services (Innovest's EcoValue rating and Sustainability Asset Management's Dow Jones Sustainability Group Index) provide data with remarkable depth concerning the extent and effectiveness of environmental management at the corporate level, and shed very useful light on national differences. But they provide information on corporations in only a handful of countries (19 and 31 of the ESI countries, respectively). We are able to generate measures for each country only because data on ISO 14001 certifications and World Business Council on Sustainable Development (WBCSD) members can be obtained for each country, but clearly these variables are of limited utility in quantifying the private sector's role in the majority of countries. Fifty-eight countries have no ISO 14001 certifications at all, and 113 have no WBCSD members. Identifying useful measures of the private sector's role in developing countries would dramatically improve our ability to quantify this indicator.

Second, these variables all attempt to relate information about private corporations to specific countries, and this is problematic. A handful of countries is home to the majority of the world's multinational corporations. Although such corporations operate globally, "credit" for their sustainable operation is assigned only to the country in which they are headquartered.

Finally, all these variables are dominated by information *about* the private sector that groups within the private sector deem to be important. What is lacking are measures about the private sector that are driven by a desire to understand environmental sustainability trends on their own terms. There are some efforts along these lines (such as the Global Reporting Initiative), but they have not yet generated comparable data. This is in part because much of the private sector tends to greet such initiatives with suspicion.

Eco-Efficiency

Description: Countries vary considerably in how efficiently they use natural resources in order to produce the goods and services consumed locally or exported. Our eco-efficiency indicator measures the amount of energy consumed per unit of GDP, and the degree to which an economy relies upon renewable sources of energy.

Strengths: For the energy sector these are very robust measures with reliable data and good country coverage. They are widely used in indicator efforts.

Weaknesses: A good measure of eco-efficiency would also measure the amount of material through-put per unit of economic output. Materials include things like construction minerals, industrial minerals, metals, and wood. Some country-level efforts along these lines have generated useful insights, yet there are currently insufficient measures to permit a meaningful global comparison (Fischer-Kowalski 2001).

Global Stewardship

No matter how successfully a country manages its internal environmental challenges, if it fails to meet its global responsibilities (e.g., addressing transboundary issues such as climate change) effectively then it will not be positioned on a sustainable trajectory. These indicators measure the degree to which countries successfully meet the challenges of global stewardship.

Participation in International Collaborative Efforts

This indicator quantifies two aspects to participation in international efforts to manage global environmental problems. This first can be called statutory participation. It measures the extent of participation in representative global environmental conventions (the Convention on International Trade in Endangered Species, the Vienna Convention on the Ozone Layer, and the Framework Convention on Climate Change), and environmentally-related international organizations.

The second aspect is financial. Because wealth is unevenly distributed, managing global environmental problems effectively requires extensive transfers of financial resources. Measures of participation in two financial mechanisms, the Montreal Protocol Multilateral Fund and the Global Environment Facility, are used to quantify this aspect. Countries receive credit both for contributing financial resources to these efforts and for implementing projects that utilize these mechanisms.

Strengths: These are by and large clear, objective measures of international participation that are relevant, reproducible, and capable of regular updates.

Weaknesses: The measures of statutory participation are somewhat thin when compared to the actual variation in national participation in these global efforts. Some countries operate major national programs in support of these conventions and organizations, allocate significant personnel to supporting them, fund scientific research on behalf of their goals, and so on, while other countries participate only nominally. Deeper measures of participation would be useful, and could be created through intensive review of available documentation.

The measures of financial participation would be more powerful if they included other modes of participation, including bilateral assistance, contributions to regional financial programs, and non-governmental financial flows. However, such data are quite difficult to assemble and make comparable (Franz 1996).

Reducing Greenhouse Gas Emissions

Appreciation of the severity of the climate change problem has steadily increased over the past 20 years. The consensus that has emerged both scientifically and politically guarantees that this issue will be central well into the future. In recognition of the critical role the climate change problem plays within the broader area of global stewardship, we have constructed a specific indicator having to do with emissions of carbon dioxide. Two variables are calculated: economic carbon efficiency is the amount of CO_2 emitted per unit of GDP; lifestyle carbon efficiency is the amount of CO_2 emitted per capita.

Strengths: Reliable CO_2 estimates are available for a large number of countries, permitting accurate measurement of this indicator. While the two variables used here do not correspond to particular international targets (the Kyoto Protocol sets varying levels of reduction goals in percentage terms), they have the benefit of being relevant to the climate change problem independently of any particular legal instruments. They are relevant benchmarks regardless of whether a country has accepted Kyoto targets.

Weaknesses: This indicator does not include measures of other greenhouse gases. This is because reliable emission inventories across a large number of countries are not available, and because the question of how to aggregate such emissions remains a subject of scientific controversy. In the future, however, it would be desirable to include other greenhouse gases.

This indicator also lacks measures of greenhouse gas fluxes attributable to land-use changes such as deforestation, afforestation, and agriculture. Such measures are clearly quite relevant. However, reliable cross-national measures are not yet available.

Reducing Transboundary Environmental Pressures

Many other environmental problems, in addition to climate change, have international dimensions. Reducing transboundary environmental pressures constitutes an important dimension of global stewardship. Comparable measures are hard to come by, but we have constructed an indicator that incorporates information on cross-border fluxes of sulfur dioxide (a precursor of acid rain), consumption of chlorofluorocarbons (which destroy the ozone layer), and two measures of pressure on marine fish stocks (because such stocks are heavily overexploited).

Strengths: These variables are built on reliable, objective measures on issues of clear international importance. They are also regularly updated.

Weaknesses: The fish pressure measure does not distinguish among exploitation of stocks that are heavily endangered and those that are not. It assumes that all extraction of living marine resources is harmful. More useful measures would more finely discriminate practices that are clearly unsustainable from those that are not.

The sulfur dioxide export measure is available only for North America, Europe and East Asia. Extending the measure to include the rest of Asia, Africa and Latin America would make it more useful.

The CFC measure is not available for individual European Union countries – such countries report only their collective consumption (we assign shares equally). But because CFCs are on a phaseout schedule in accord with the Montreal Protocol and its amendments, over time this indicator will cease to be relevant anyway.

There are many other transboundary pressures that would be very useful, but reliable comparable measures are not available. These include contamination of international rivers, trade in endangered species, smuggling of hazardous waste, emissions of persistent organic pollutants that travel long distances, emissions of sewage and industrial effluent that contaminates regional seas, and ocean dumping of waste. Often the fact that such activities are illegal or politically sensitive is what makes them so hard to monitor.

References

Access Initiative, *Access Initiative Summary*, 2001 (available at http://www.accessinitiative.org/access_summary.html).

Alcamo, J., T. Henreichs, and T. Rosch, *World Water in 2025: Global Modeling and Scenario Analysis for the World Commission on Water for the 21st Century*, Kassel World Water Series Report No. 2, Center for Environmental Systems Research, University of Kassel, February 2000.

Fischer-Kowalski, M. "Rapid Metabolic Change in the Global South as a Chance and a Threat to Sustainability. The Case of Amazonia," presented at the 2001 Open Meeting of the Human Dimensions of Global Environmental Change, Rio de Janeiro, Brazil, 5-7 October 2001 (available at http://sedac.ciesin.columbia.edu/openmeeting/dowloads/1003419117_presentation_amaz1ihdpend.ppt).

Franz, W.E., "Appendix: The Scope of Global Environmental Financing - Cases in Context," pp. 367-380 in R.O. Keohane and M.A. Levy (eds.), *Institutions for Environmental Aid*, Cambridge: MIT Press, 1996.

Kuylenstierna, J., H. Rodhe, S. Cinderby and K. Hicks. "Acidification in developing countries: ecosystem sensitivity and the critical load approach at global scale." *Ambio*, 30 (1), 2001, pp. 20-28.

Matthews, E. *Understanding the FRA 2000*, Forest Briefing No. 1, World Resources Institute, March 2001.

National Research Council, *Ecological Indicators for the Nation*, Washington: National Academy Press, 2000.

Organization for Economic Co-Operation and Development (OECD), *Environmental Outlook*, Paris, 2001.

Porter, M.E. and S. Stern, "National Innovative Capacity," Chapter 2.2 in M. Porter and J. Sachs (eds.), *The Global Competitiveness Report 2001-2002*, New York: Oxford University Press, 2001, p. 104.

United Nations, "Indicators of Sustainable Development: Guidelines and Methodologies," 2001, available at http://www.un.org/esa/sustdev/indisd/isdms2001/isdms2001isd.htm.

Wackernagel, M., D. Deumling, C. Monfreda, A.C. Linares, I.S. López Falfán, and M.A. Vásquez Sánchez, *Ecological Footprint of Nations*, December 2001 update (available at http://www.rprogress.org/publications/1997_efoot.pdf).

World Economic Forum, *2001 Environmental Sustainability Index*, January 2001 (available at http://www.ciesin.columbia.edu/indicators/ESI/), p. 23.

World Resources Institute, *World Resources 2000-2001*, Washington, DC: World Resources Institute, 2000, Technical Notes to Table AC.2.

World Wildlife Fund, *Hard Facts, Hidden Problems: A Review of Current Data on Fishing Subsidies*, A WWF Technical Paper, 2001.

Annex 2. ESI Methodology

In this annex we present an overview of the ESI methodology, focusing primarily on how data were processed and aggregated. Annex 3 describes in more detail how select missing data were imputed.

Country Selection

A total of 142 countries were selected for inclusion in the ESI, based on the following four criteria:

1. **Population**. Countries with total 2001 population under 100,000 were eliminated. The logic was that very small countries would be sparse in data coverage and difficult to estimate missing values for, because they would have many fundamental differences as compared to the majority of countries in the data set.
2. **Area**. Countries under 5,000 square kilometers were eliminated, for the same reason that countries with small populations were eliminated.
3. **Variable coverage**. Only countries that had a minimum of 40 of the 68 variables used in the ESI were retained in the ESI dataset.
4. **Indicator coverage**. Some countries that survived the first three screens did not have even coverage across the 20 ESI indicators. We required that all countries in the ESI have observed variables in each of the ESI indicators, with the following exceptions:
   a. Air Quality and Water Quality had relatively low country coverage across all their constituent variables, but were judged to be too important on substantive grounds to eliminate. We wanted to retain the information we could for countries that report air and water quality, because these are such vital indicators, but we did not want to exclude from the ESI the many countries who fail to report such data.
   b. Science and Technology also had relatively low country coverage, but contained a variable (number of years of schooling for people above age 15) that performed extremely well in imputation tests. We are relatively confident of our estimates of this indicator for countries lacking observations.

If a country was missing *all* variables in *any* one of the 17 indicators not listed above, it was removed.

Making the variables comparable

We denominated selected variables so as to facilitate fair comparison across countries. Some variables needed no change in denominator because they were already collected in a way that permitted international comparison. Variables having to do with national governance systems, for example, were already comparable. Most of the environmental stress variables, however, were not comparable as they were obtained. They typically reported the quantity of a particular pollutant, but did not take into account differences in size and sensitivity. We experimented with different ways to make such stress variables comparable, and ended up in many cases with a denominator called "populated land area." Populated land area in this case refers to the size of that portion of a country's territory where population density exceeds five persons per square kilometer. This measure avoids the mistake of considering countries with large, sparsely inhabited land areas to "offset" their pollution with their whole land area, when in most cases the actual emissions only occur where population density is above a certain threshold. It assumes that pollution and other stresses are highly correlated with the location of people, and that all things being equal, a given amount of pollution in a small area is worse than the same amount in a large area.

Other denominators included GDP and total population. The selection of the denominator is made explicit in each of the variable tables in Annex 6.

We next trimmed the tails of the variable distributions to avoid having extreme values overly dominate the aggregation algorithm, and to partially correct for the possibility of data quality problems in such extreme cases. (Other things being equal, there is reason to believe that values extremely far from the mean are more likely to reflect data quality problems.) For any observed value greater than the 97.5 percentile, we lowered the value to equal the 97.5 percentile. For any observed value lower than the 2.5 percentile, we raised it to equal the 2.5 percentile. We did this for each variable, but the total number of affected values was very small. The cutoff values appear in each variable table in Annex 6.

We then converted extremely skewed distributions (those with a skewness measure of 4.0 or above) to a base-10 logarithmic scale. In the absence of such a conversion these variable scores typically generated high positive or negative values for one or two countries and smaller, identical values for each of the remaining countries. Such distributions failed to convey useful information in aggregating across variables. The following variables were converted to a logarithmic scale:

- Forest Stewardship Council accredited area
- subsidies to fishing industry
- per-capita water inflow from other countries
- CFC consumption
- industrial organic pollutants per available fresh water

Finally, we converted all the variables to a unitless scale by standardizing them. We chose the z-score, which has desirable characteristics when it comes to aggregation. In particular, the fact that the z-score always has an average of zero means that it avoids introducing aggregation distortions stemming from differences in variable means. The formula to calculate the z-score is the value of variable minus the mean of the variable, divided by the standard deviation. For variables in which high observed values correspond to low values of environmental sustainability, we reversed the terms in the numerator to preserve this ordinal relationship. In other words, for variables such as "percentage of land area under protected status" we used the conventional z-score, whereas for variables such as "percentage of mammals threatened" we produced a z-score in which the higher the percentage, the lower the score.

Aggregating the Data

Indicators were calculated by averaging the standardized values (z-scores) for each variable in the indicator. Each variable received equal weight, and in cases in which a variable was missing it was simply not included in the average.

The ESI was calculated by taking the unweighted average of the values of the 20 indicators (because of our case selection rules and imputation approaches, each country has a value for each of the 20 indicators). If they were fully understood, underlying processes would almost surely support an algorithm of unequal weighting, with differential weights derived from the different degrees of impact on overall environmental sustainability. However, in our judgment there was no firm basis for applying differential weights given the current state of scientific understanding; nor is there likely to be scientific consensus about the relative contributions of different factors to sustainability any time soon.

We also report a different level of aggregation, the five components of Environmental Sustainability: Environmental Systems, Reducing Environmental Stresses, Reducing Human Vulnerability, Social and Institutional Capacity, and Global Stewardship. These aggregations are provided in the components and indicators section (Annex 4) and country profiles (Annex 5) as a way of summarizing the indicator values in more condensed form. Note that because the components do not have equal numbers of indicators, the ESI is not equal to the average of the five components.

To make the ESI and component scores more intuitively understandable, we converted the z-score average (a typical range would be from about –2.5 to +1.8) to standard normal percentile. The standard normal percentile has a theoretical minimum of zero and a theoretical maximum of 100, but is calculated in such a way that the maximum and minimum values are realized only at observed values between about 2.5 and 3 standard deviations away from the mean. Values within that range receive scores in between the minimum and maximum, regardless of where other countries' values lie in comparison. Likewise, values that fall outside that range do not receive significantly better or worse scores than values that lie between 2.5 and 3 standard deviations from the mean. Therefore, the standard normal percentile comes closest to preserving the information contained in the original z-scores, while portraying them in a manner more graspable by a broad audience. When reporting the individual indicator values, we opted to report the original z-scores; this preserves more information from the underlying variable averages, because for a handful of indicators observed minimum and maximum values fall beyond the range that a standard normal percentile assumes.

We tested the distinctiveness of the ESI's 20 indicators by looking at their bivariate correlations and experimenting with data reduction.
As a group, the 20 indicators had an average bivariate correlation among themselves of only .05. Only 19 of the 180 possible pairs of indicators had correlation coefficients greater than .5. The highest such pairs were Basic Human Sustenance and Environmental Health (.81) and Environmental Health and Reducing Population Stress (.80). The first of these pairs could plausibly be combined based on the high correlation; however, that would obscure potentially interesting variance (e.g. countries that score higher on one than the other). As long as the total number of highly correlated indicator pairs is relatively low, as is the case in the ESI, we think it is preferable to keep the indicators separate so as to permit investigation into potentially useful causal connections among them, and to permit reporting of measures that are relevant for discrete policy communities. For example, the most highly correlated indicator pair contains one indicator that is primarily relevant to the food security community and another that is primarily relevant to the public health community. Keeping the indicators separate lets us be relevant to both communities. It also lets us (cautiously) explore causal interactions. For example, we might wish to explore possible causal connections between air quality and environmental health (.71). Too much data reduction makes such investigation impossible.

We performed factor analysis on the ESI's indicators to explore whether there was any possibility of reducing the dimensions based on principal components. Using the variables as the inputs, 17 principal components were generated. Using the 22 indicators, 5 principal components were generated. But in neither case did the principal components have any sensible interpretations, and we concluded that factor analysis was not a useful way to reduce the dimensionality of the ESI data set.

Our conclusion is that the 20 indicators that form the core building blocks of the ESI, derived from theoretical considerations and intended to be policy-relevant, are the most effective dimensions along which to report results.

Changes from Prior Releases of the ESI

The 2002 ESI builds on experience gained from the 2000 Pilot ESI and the 2001 ESI. Both those prior efforts were submitted to rigorous peer review drawing on recognized international experts, generated extensive critical review in publications and in personal communications to the ESI team, and finally were examined in a number of expert workshops organized in international locations.

As a result of this experience, criticism, and reflection, a number of improvements were made in the 2002 ESI. As a result, the country values across these different versions are not comparable. Although many variables were updated with new values, the differences in methodology and aggregation are profound enough that the 2002 ESI is fundamentally different than the 2001 ESI. The most significant differences can be summarized as follows:

Addition of a Climate Change Indicator

Although the 2001 ESI had a large number of variables and indicators directly relevant to the problem of climate change (such as greenhouse gas emissions, eco-efficiency, extent of use of renewable energy, consumption of natural resources, and others) it did not contain a separate climate change indicator. As a result, it was possible for countries that were emitting extremely high levels of greenhouse gases to score high on the overall ESI.

In recognition of the high importance of the climate change problem to the challenge of environmental sustainability, we have created a new, separate indicator called Greenhouse Gas Emissions, consisting of two underlying variables: carbon dioxide emissions per capita, and carbon dioxide emissions per GDP. Some of the countries that scored relatively high in the 2001 ESI score very low on this indicator (the U.S. is ranked 133rd out of 142, for example). Countries scoring lowest on this indicator, in general, score lower on the overall 2002 ESI than they did in 2001 (the U.S. is now ranked 51st instead of 11th, for example).

We continue to feel strongly, however, that environmental sustainability is not *equivalent* to climate change, but rather requires consideration of the other important indicators we have included in the ESI on matters such as air and water quality, pressure on land resources, and biodiversity conservation.

Reduction in Number of Capacity Indicators

The 2001 ESI had seven indicators having to do with social and institutional capacity. Because per-capita income had a strong correlation with these capacity indicators, the result was that almost a third of the ESI was determined by factors driven to a large degree (though by no means completely) by income levels. Although we continue to think that capacity measures are of vital importance in shaping environmental sustainability, we have attempted to strike a more balanced role in the overall ESI by using five, instead of seven, capacity indicators.

The former indicator on Environmental Information was folded into the indicator on Capacity for Debate. We created a new Environmental Governance indicator drawn from variables formerly in Regulation and Management and Reducing Public Choice Distortions.

Improved Imputation Procedures

Because the problem of missing data is likely to plague the search for useful environmental sustainability indicators for some time, we think that continued innovation in imputation techniques is warranted. The 2001 ESI relied on a limited number of individual linear regressions with determinate outcomes, whereas for the 2002 ESI we used a more sophisticated approach. This approach is described in more detail in Annex 3. Its outcomes are indeterminate (and therefore run multiple times and averaged) and rely on large number of sequential regressions. These new methods extract more useful information from what is available in the overall ESI data set while reflecting more accurately the underlying uncertainty in the estimation process. To be totally transparent about the imputation results, imputed values are included in the data tables contained in Annex 6 with brackets.

This page is intentionally blank.

Annex 3. Imputing Missing Values

Prepared by Kobi Ako Abayomi, CIESIN; Andrew Gelman, Professor, Department of Statistics, Columbia University; and Tanja Srebotnjak, United Nations Statistics Division, New York[1]

Of the 68 variables in the ESI, only 27 had full country coverage. The remaining 47 variables had an average coverage of 68 countries. In order to generate indicator scores for each of the 142 countries it was thus necessary to replace missing values with imputed values for those variables that were considered suitable for estimation. Variables that were excluded from estimation but whose observed values were used as predictors for other variables include the World Economic Forum survey results, water availability, and percentage of mammals threatened. Missing values were estimated and then utilized in the calculation of the ESI indicators for the variables listed in Table A3.1.

Table A3.1. Variables for which missing values were estimated and used in the ESI

Variable	Number of countries with missing values
Suspended solids	101
Electrical conductivity	100
Phosphorus concentration	94
Urban TSP concentration	93
Urban NO2 concentration	91
Urban SO2 concentration	91
Dissolved oxygen concentration	90
Child death rate from respiratory diseases	88
SO2 exports	86
Death rate from intestinal infectious diseases	79
Pesticide use per hectare of crop land	51
Mean years of schooling (age 15 and above)	45
Percent of Population with Access to Improved Drinking-Water Supply	32
Energy efficiency (total energy consumption per unit GDP)	13
Vehicles per populated land area	8
Ratio of gasoline price to international average	6
Proportion of Undernourished in Total Population	5
Carbon economic efficiency (CO2 emissions per dollar GDP)	3
NOx emissions per populated land area	2
VOCs emissions per populated land area	2
Ecological footprint per capita	1
Fertilizer consumption per hectare of arable land	1
SO2 emissions per populated land area	1
Under-5 mortality rate	1

Overview

A so-called multivariate *imputation* procedure, which is a method for filling missing data, can be used when some components of a vector observation are unavailable (Little and Rubin 1987).[2] Commonly two major assumptions are made:

1. The pattern of missing values in a multivariate (i.e. vector) observation does not depend on the unobserved responses. In other words, the probability that a value is missing may depend on the observed values but is independent of the missing value itself. Such a mechanism is called Missing at Random (MAR). If, in addition, the parameters governing the missingness process (i.e., patterns of missing data) are independent of the parameters of the complete data model, the missing data mechanism is called ignorable.

2. A functional form for the distribution of the vector observations can be formulated, and the estimates for the parameters of that form can be approximated using, in most instances, some iterative procedure (Wichern and Johnson 1998).

Imputation procedures can be single or multiple. The key idea behind multiple imputation is to create a finite number of say, *m*, completed data sets, each of which is then analyzed using standard statistical methods. The results of the *m* single analyses are combined to yield a final estimate of the parameter of interest. The advantage of this method is that with repeated application of complete data analysis procedures, the uncertainty inherent in the imputation process can be captured in the variation between the multiple datasets.

The simplest ways of handling missing data are *complete-case* and *available-case* methods (Little and Rubin 1987). The complete-case method uses only the cases for which all variables are observed. To use this method in the case of the ESI would require either a sample size of 4, or else the number of variables would have to be restricted. But then the measure would be limited. The available-case method is based on analyzing each variable with all the cases for which the variable is observed. The ESI, however, is a composite index based on a cross-variable aggregation algorithm. Since we want to consider all 68 factors and all 142 countries, we decided to use imputation methods. It is important to note that excluding cases should *not* be thought of as "purer" or less "assumption-laden" than imputation, since exclusion and averaging to compose the ESI is mathematically equivalent to imputing all missing data with averages of the available cases, which, as seen in our data, is not sensible.

Imputations are sometimes performed using one variable at a time (e.g., mean substitution), or working with subsets of variables. However, we prefer to use all the variables in the imputations and opted for a *Sequential Regression Multivariate Imputation* (SRMI) approach, which iteratively uses generalized linear models, to estimate missing values in the 2002 ESI.[1]

The SRMI procedure is favored for its relative computational simplicity and for the less restrictive assumptions made on a dataset as compared, for example, to methods based on the multivariate normal or t-distribution. Simplicity and generality are important to us given the size of the ESI dataset and complexity of the ESI variables.

The SRMI Procedure

The procedure partitions the data set of n variables into the set of n_1 variables with no missing values, call it $X=(X_1,X_2,...,X_{n1})$ and the ordered set of $(n-n_1)$ variables with missing values, $Y=(Y_1,...Y_{n-n1})$, ordered by missingness – from least to most. At each step of the procedure the conditional distribution of each Y_i, $i=1,..., n-n_1$, given the observed values is modeled by a regression on X, and missing values are filled using the model. The model parameters (i.e. regression coefficients) are assumed to have a prior distribution, in the Bayesian sense, which is diffuse relative to the likelihood. Assuming a diffuse distribution for the parameters allows for perturbations and thus randomization in the imputation procedure, but retains the desirable modeling characteristics of regressions.

The algorithm to generate the first imputed data set consists of the following steps:

1. The first round of the SRMI algorithm begins by regressing Y_1 – the variable with the least "missingness" – upon X, the set of variables with no missing values.
2. Now Y_1 is entered into X and the algorithm regresses Y_2 on $X=(X_1, X_2, ..., X_{n1}, Y_1)$. The algorithm continues until Y_{n-n1} is completed by regressing it on $X=(X_1, X_2, ..., X_{n1}, Y_1, ..., Y_{n-n1})$.
3. The next round continues in the same manner, with $X=(Y_1,...,Y_{i-1}\ Y_{i+1},...,Y_{n-n1})$ as the predictor set for each Y_i, $i=1,...,n-n1$.
4. The algorithm cycles through the steps 1 to 3 until convergence in the imputed values is reached (Raghunathan et al. 2001).

The algorithm is then repeated m times to yield m imputed data sets. Each data set is analyzed and the results are combined to a final parameter estimate (i.e., a final ESI and indicator scores for each country).

Application

We note characteristics specific to the imputation procedure for the 2002 ESI.

Distributional

- All variables were assumed continuous by default. The implication of this is that categorical variables will be imputed continuously; for example, a variable that can equal 1, 2, or 3, might be imputed as 1.3 or 2.1.
- Boundaries on imputations were imposed and set by the extrema of the observed distribution so as to avoid introducing outliers via the imputation procedure. This reasoning might constrain the imputed values too much, but we do this to avoid the alternative, which is unreasonably low or high imputations.

Predictive

- ESI and non-ESI variables were included in the predictive (or information) set. Where possible, we chose to benefit from the availability of additional information to bear upon our imputation procedure. We reason that we can more accurately estimate missing values with additional information.
- Combining predictors into scores where appropriate to reduce the dimensionality of the prediction regressions. The predictors, when put in uncombined, overfit the data and did not give reasonable imputations
- Transformations of the GDP variable (logged and squared) and a dummy variable for an income threshold were

included in the information set. This addition to the procedure more closely mirrors current thought on the distribution of environmental characteristics vs. income.

Procedural

- A constant minimum R-squared of 0.10 was set for each prediction equation to balance the often-contrasting goals of modeling parsimony vs. variance explanation.
- A maximum number of predictors were set for the water supply variables. We noticed that predicted values in a constrained model were less variant.
- Perturbations were permitted in the predicted values but not in the regression parameters, reasoning that without a sound argument for a particular prior distribution for the regression parameters, the ordinary maximum likelihood estimates are preferred.

Comparison: SRMI with MCMC procedure

We were able to compare the estimates used in the 2002 ESI with those generated by an alternate multiple imputation method. This method uses *Markov Chain Monte Carlo* (MCMC) simulation to substitute the missing values with plausible quasi-random draws from their conditional distribution given the observed data. The MCMC approach is similar to the SRMI approach in that it assumes an ignorable MAR process for the missingness generating mechanism. However, there exist distinct differences in the imputation algorithm and the data model assumptions. First, the full data set, Y, is assumed to have a well-specified distribution, most often a multivariate normal distribution, with independent and identically distributed *(iid)* observations. Second, the missing values are imputed iteratively in a Bayesian framework using a Markov Chain. The algorithm is as follows:

1. Given a prior distribution for the parameters θ of the data model (in the case of the multivariate normal distribution the parameters would be the mean and the covariance matrix) and an initial estimate of the parameters, the missing data, Y_m, are imputed by random sampling from the conditional distribution of the missing data, Y_m, given the observed data, Y_o, and the initial parameter estimates.
2. The thus completed data set is then used to update the initial parameter estimate by sampling from the joint posterior distribution of the parameters given the completed data set.
3. Iterating through step 1 and 2 generates a Markov Chain of pairs of (Y_{m}, θ), which once convergence is diagnosed, produces the first imputed data set.
4. Step 1 to 3 are then repeated to generate m imputed data sets, which are analyzed individually and their results combined to a final ESI score for each country.

While the MCMC approach utilizes a model for the joint data distribution, the SRMI procedure uses marginal distributions to approximate the joint distribution and the assumption of multivariate normality is not required. The application of either method depends on the characteristics of the data at hand and the purpose of the analysis. For the ESI data, imputations were generated using both methods in order to compare the results and to test the robustness of the index.

Results of Comparison

In general, we comment that differences in the results of the two methods appear slight on the ESI level, despite some particular divergence at the variable level. The overall difference in mean between an ESI generated for both methods was only 0.03, and the average absolute difference between ESI scores was a mere

1.7. We feel these differences are negligible, given the observed range in ESI scoring. There were changes in country rankings across the methods, especially at the middle of the distribution of ESI scores. We attribute this more to the effect of the closeness in ranking rather than to the difference in estimation procedures.

We do note an appreciable degree of difference in estimates for subsets of variables that we have already identified as difficult to estimate – particularly air quality and water quality. We note here that the variance of estimates of these quantities is high within estimation method as well.

From a purely methodological perspective, we think that the similarity between the results of either method does not favor the choice of one over the other; we used the estimates generated by the SRMI procedure for the reasons stated above. We view the resemblance of the outputs, given the differences in the methods, as justification of the use of the imputation procedure.

End Notes

[1] The findings, interpretations and conclusions expressed in this annex are entirely those of the authors and should not be attributed in any manner to the United Nations, to its affiliated organizations, or the countries they represent.

[2] A *vector* or *multivariate* observation is one composed of several data points in each case. The ESI is composed of 68 variables, and therefore has an observation of dimension 68.

[3] As implemented in the IVE Ware addition to SAS. Available at http://www.isr.umich.edu/src/smp/ive/

References

Little, R.J., and D.B. Rubin, *Statistical Analysis with Missing Data* New York: Wiley, 1987.

Raghunathan, T. E., Lepkowski, J. M., Van Hoewyk, J., and Solenberger, P. "A Multivariate Technique for Multiply Imputing Missing Values Using a Sequence of Regression Models," *Survey Analysis*, 2001 (in press).

Wichern, D.W., and R.A. Johnson. *Applied Multivariate Statistical Analysis*, New Jersey: Prentice Hall, 1998.

This page is intentionally blank.

Annex 4. Component and Indicator Scores

This section provides tables that rank the 142 countries contained in the ESI according to the five components and the twenty indicators. These tables provide a more detailed view into comparative country positions than the overall ESI score shown on page 3 of the main report.

The component scores are presented as standard normal percentiles, ranging from a theoretical low of 0 to a theoretical high of 100. The indicator scores are presented as averages of the constituent variable values. These variable values, as described in Annex 2, are in the form of z-scores, with zero indicating the mean, +1 and –1 representing one standard deviation above and below the mean, +2 and –2 representing two standard deviations above and below the mean, and so on. In a "normal," bell-shaped distribution 68 percent of the scores fall within one standard deviation of the mean, 95 percent within two standard deviations, and 99.7 percent within three standard deviations. The actual distributions vary among the ESI indicators and variables.

The tables appear in the following sequence (related indicators are grouped together):

Component:	Environmental Systems
Component:	Reducing Environmental Stresses
Component:	Reducing Human Vulnerability
Component:	Social and Institutional Capacity
Component:	Global Stewardship
Indicator:	Air Quality
Indicator:	Water Quantity
Indicator:	Water Quality
Indicator:	Biodiversity
Indicator:	Land
Indicator:	Reducing Air Pollution
Indicator:	Reducing Water Stress
Indicator:	Reducing Ecosystem Stress
Indicator:	Reducing Waste and Consumption Pressures
Indicator:	Reducing Population Growth
Indicator:	Basic Human Sustenance
Indicator:	Environmental Health
Indicator:	Science and Technology
Indicator:	Capacity for Debate
Indicator:	Environmental Governance
Indicator:	Private Sector Responsiveness
Indicator:	Eco-efficiency
Indicator:	Participation in International Cooperative Efforts
Indicator:	Reducing Greenhouse Gas Emissions
Indicator:	Reducing Transboundary Environmental Pressures

Component: Environmental Systems

1. Canada	90.4
2. Gabon	81.2
3. Finland	78.7
4. Norway	77.6
5. Venezuela	77.2
6. Botswana	77.2
7. Congo	75.8
8. Namibia	75.0
9. Iceland	73.1
10. Argentina	72.4
11. Russia	72.2
12. Sweden	72.1
13. Bolivia	71.1
14. Mongolia	70.5
15. Colombia	69.8
16. Peru	69.3
17. Central African Rep.	68.6
18. Papua New Guinea	66.9
19. Brazil	66.3
20. Australia	66.1
21. Uruguay	65.4
22. Ecuador	65.3
23. Austria	64.6
24. Paraguay	63.8
25. Latvia	62.9
26. Angola	62.6
27. Albania	62.2
28. Mali	60.5
29. Nicaragua	60.5
30. United States	60.1
31. Lithuania	59.7
32. Slovakia	59.3
33. Chad	59.2
34. Malaysia	58.9
35. Estonia	57.7
36. Laos	57.6
37. Ireland	57.2
38. Honduras	57.2
39. Panama	57.1
40. Zimbabwe	56.5
41. Mauritania	55.4
42. Moldova	55.0
43. Mozambique	54.9
44. Tanzania	54.9
45. Turkey	54.8
46. Slovenia	54.5
47. Guatemala	54.0
48. Egypt	53.8
49. Hungary	53.7
50. Libya	53.7
51. Croatia	53.4
52. Portugal	53.3
53. Niger	53.3
54. Zaire	53.1
55. Sudan	53.1
56. Byelarus	53.0
57. Czech Republic	52.7
58. Switzerland	52.4
59. Liberia	52.4
60. Ghana	52.3
61. Kenya	51.9
62. Senegal	51.9
63. Costa Rica	51.5
64. France	50.7
65. Kazakhstan	50.6
66. Armenia	50.4
67. Malawi	50.4
68. Algeria	50.3
69. Chile	50.3
70. El Salvador	50.1
71. Thailand	50.0
72. Zambia	49.8
73. Trinidad and Tobago	49.7
74. Guinea	49.7
75. Bhutan	49.4
76. Uzbekistan	49.2
77. Uganda	49.0
78. New Zealand	49.0
79. Tunisia	48.4
80. Syria	48.3
81. Romania	48.1
82. Cameroon	47.1
83. Togo	47.1
84. Somalia	47.0
85. Cambodia	47.0
86. Oman	46.0
87. Bosnia and Herz.	45.8
88. Ivory Coast	45.4
89. Germany	45.3
90. Burundi	45.1
91. South Africa	44.8
92. Netherlands	44.7
93. Myanmar (Burma)	44.7
94. Burkina Faso	44.7
95. Azerbaijan	44.2
96. Denmark	43.9
97. Greece	43.7
98. Ethiopia	43.6
99. Rwanda	43.6
100. Kyrgyzstan	43.5
101. Macedonia	43.0
102. Benin	43.0
103. Ukraine	42.7
104. Vietnam	42.7
105. Jordan	42.7
106. Tajikistan	42.5
107. Sierra Leone	42.1
108. Spain	41.0
109. Iran	41.0
110. Bangladesh	40.9
111. Gambia	40.3
112. Nigeria	39.7
113. Israel	39.2
114. Poland	38.6
115. United Kingdom	38.5
116. Turkmenistan	38.0
117. Nepal	37.8
118. Sri Lanka	37.8
119. Pakistan	37.6
120. Guinea-Bissau	37.3
121. Dominican Republic	36.9
122. Bulgaria	35.9
123. Lebanon	35.5
124. Saudi Arabia	35.0
125. Iraq	34.9
126. Morocco	33.2
127. Italy	33.0
128. Japan	32.7
129. Indonesia	32.6
130. China	31.5
131. Cuba	31.2
132. Mexico	31.1
133. India	27.4
134. United Arab Emirates	27.3
135. Belgium	25.9
136. South Korea	21.7
137. Madagascar	21.5
138. Jamaica	21.4
139. Philippines	19.6
140. North Korea	19.4
141. Kuwait	19.1
142. Haiti	18.1

Component: Reducing Environmental Stresses

1. Byelarus	70.3
2. Cuba	69.6
3. Armenia	69.2
4. Latvia	68.9
5. Moldova	68.9
6. Mozambique	68.2
7. Myanmar (Burma)	67.6
8. Estonia	67.4
9. Kyrgyzstan	67.2
10. Croatia	65.9
11. Bangladesh	65.4
12. Dominican Republic	65.1
13. Lithuania	64.9
14. Peru	64.8
15. Kazakhstan	64.3
16. Bosnia and Herze.	64.2
17. Thailand	63.7
18. Zimbabwe	63.7
19. Brazil	63.2
20. Kenya	62.9
21. Gabon	62.9
22. Albania	62.8
23. Romania	62.3
24. Bhutan	62.0
25. Portugal	61.6
26. Central African Rep.	61.5
27. Bolivia	61.4
28. Tajikistan	61.3
29. Azerbaijan	61.2
30. Cambodia	60.9
31. Panama	60.9
32. Indonesia	60.8
33. Venezuela	60.8
34. Argentina	60.5
35. Uruguay	60.5
36. Cameroon	60.5
37. Guinea	60.4
38. Algeria	60.2
39. Hungary	60.0
40. Russia	60.0
41. Ghana	59.9
42. Turkey	59.7
43. Bulgaria	59.4
44. Morocco	59.2
45. Tanzania	59.0
46. Colombia	59.0
47. Gambia	58.6
48. Sri Lanka	58.4
49. Mongolia	58.3
50. Iran	58.2
51. Finland	57.7
52. Norway	57.6
53. Chile	57.4
54. Ecuador	57.2
55. Sudan	57.1
56. Guinea-Bissau	57.1
57. Tunisia	56.9
58. Senegal	56.8
59. Papua New Guinea	56.7
60. Laos	56.4
61. Haiti	56.4
62. Angola	56.2
63. Philippines	56.1
64. Honduras	56.1
65. China	55.9
66. Madagascar	55.7
67. Burkina Faso	55.4
68. Nicaragua	55.4
69. India	55.3
70. Slovakia	55.3
71. Spain	55.1
72. Ethiopia	55.0
73. Mexico	54.7
74. Uzbekistan	54.6
75. Togo	53.9
76. South Africa	53.8
77. Botswana	53.1
78. Rwanda	52.7
79. Paraguay	52.4
80. Ivory Coast	52.0
81. Turkmenistan	51.9
82. Chad	51.7
83. Guatemala	51.3
84. Vietnam	51.2
85. Jordan	51.2
86. Mali	51.2
87. Sweden	51.2
88. Congo	51.1
89. North Korea	50.6
90. Benin	50.1
91. Malawi	49.8
92. Greece	49.6
93. Zambia	49.5
94. Zaire	49.3
95. El Salvador	49.2
96. Nepal	48.9
97. Egypt	48.4
98. Namibia	48.1
99. Pakistan	47.7
100. Iraq	47.7
101. Jamaica	47.6
102. Syria	47.4
103. Trinidad and Tobago	47.2
104. Canada	47.0
105. Mauritania	46.6
106. Somalia	46.2
107. Uganda	46.0
108. Liberia	45.8
109. Slovenia	45.6
110. Burundi	45.6
111. Costa Rica	45.3
112. Nigeria	45.2
113. Australia	43.6
114. Sierra Leone	43.4
115. Malaysia	43.2
116. Ukraine	43.0
117. Poland	42.1
118. New Zealand	40.5
119. Niger	40.4
120. Austria	40.1
121. Oman	38.3
122. Macedonia	37.2
123. Switzerland	36.1
124. Italy	35.6
125. Lebanon	35.4
126. Israel	35.2
127. France	34.6
128. Iceland	33.3
129. Czech Republic	32.0
130. Libya	31.2
131. United States	30.8
132. Denmark	29.2
133. Japan	28.9
134. Saudi Arabia	28.8
135. Ireland	28.0
136. Germany	25.1
137. Netherlands	21.1
138. South Korea	15.6
139. United Arab Emirates	12.6
140. United Kingdom	12.3
141. Kuwait	10.2
142. Belgium	9.4

Component: Reducing Human Vulnerability

1. Austria	85.1
2. Netherlands	85.1
3. Sweden	85.0
4. Canada	85.0
5. Slovenia	85.0
6. Australia	84.9
7. Finland	84.9
8. United Kingdom	84.8
9. Norway	84.8
10. Hungary	84.3
11. Slovakia	84.3
12. Switzerland	84.3
13. Ireland	83.9
14. Iceland	83.6
15. Italy	82.7
16. New Zealand	82.2
17. France	82.2
18. Japan	82.1
19. Denmark	82.0
20. Greece	81.9
21. South Korea	81.7
22. Uruguay	81.1
23. Germany	80.9
24. Belgium	80.8
25. Spain	80.6
26. Israel	80.4
27. United States	80.4
28. Chile	79.9
29. Russia	79.7
30. Czech Republic	79.7
31. Byelarus	79.3
32. Bulgaria	79.1
33. Costa Rica	79.1
34. Portugal	78.9
35. Poland	78.5
36. Moldova	77.3
37. Croatia	76.6
38. Kuwait	76.5
39. Estonia	76.3
40. Saudi Arabia	76.2
41. Argentina	75.2
42. United Arab Emirates	75.0
43. Lebanon	74.8
44. Latvia	74.8
45. Macedonia	73.8
46. Ukraine	73.6
47. Malaysia	73.0
48. Cuba	72.6
49. Colombia	71.7
50. Trinidad and Tobago	71.4
51. Jordan	70.9
52. Iran	70.7
53. Kazakhstan	70.6
54. Tunisia	68.8
55. Syria	68.1
56. Mexico	67.2
57. Turkey	66.8
58. Panama	66.2
59. Brazil	66.0
60. Lithuania	64.8
61. Algeria	64.2
62. Bosnia and Herze.	63.7
63. Romania	62.7
64. Libya	62.2
65. Egypt	62.1
66. China	61.9
67. Jamaica	61.4
68. Honduras	61.3
69. Ecuador	61.2
70. Paraguay	60.7
71. Morocco	60.4
72. Uzbekistan	60.3
73. Albania	59.8
74. Thailand	58.9
75. North Korea	57.9
76. Venezuela	57.8
77. South Africa	57.7
78. Indonesia	57.5
79. Philippines	56.4
80. Sri Lanka	56.3
81. Kyrgyzstan	52.3
82. Guatemala	52.3
83. Dominican Republic	51.5
84. Peru	51.1
85. Botswana	51.0
86. Armenia	51.0
87. Vietnam	50.5
88. El Salvador	48.8
89. Azerbaijan	47.6
90. Nicaragua	45.6
91. India	43.8
92. Bolivia	43.5
93. Turkmenistan	42.0
94. Pakistan	41.5
95. Oman	41.0
96. Bangladesh	40.3
97. Zimbabwe	39.2
98. Namibia	38.5
99. Gambia	37.3
100. Laos	35.3
101. Iraq	33.8
102. Mongolia	32.8
103. Myanmar (Burma)	32.6
104. Ghana	32.3
105. Nepal	31.5
106. Bhutan	31.4
107. Senegal	30.6
108. Sudan	29.5
109. Gabon	25.6
110. Congo	25.1
111. Ivory Coast	22.4
112. Tajikistan	21.6
113. Benin	21.0
114. Togo	18.3
115. Nigeria	18.2
116. Papua New Guinea	18.0
117. Uganda	15.4
118. Cameroon	15.1
119. Burkina Faso	10.3
120. Kenya	10.2
121. Tanzania	9.9
122. Mauritania	9.7
123. Central African Rep.	9.4
124. Mali	9.3
125. Cambodia	8.2
126. Guinea	8.1
127. Madagascar	7.9
128. Haiti	7.9
129. Malawi	7.4
130. Zambia	6.9
131. Burundi	6.4
132. Rwanda	6.1
133. Mozambique	5.4
134. Niger	5.1
135. Guinea-Bissau	5.1
136. Liberia	3.9
137. Chad	3.8
138. Somalia	3.5
139. Zaire	2.7
140. Ethiopia	2.4
141. Sierra Leone	2.2
142. Angola	1.9

Component: Social and Institutional Capacity

1. Switzerland	91.5
2. Finland	88.0
3. Sweden	86.6
4. Norway	85.5
5. Netherlands	81.7
6. Denmark	81.4
7. Costa Rica	81.2
8. Iceland	78.9
9. United Kingdom	78.7
10. New Zealand	77.3
11. Germany	75.6
12. Canada	75.1
13. Japan	75.0
14. Austria	74.2
15. United States	74.1
16. Australia	70.6
17. Ireland	69.6
18. Croatia	69.5
19. France	68.8
20. Uruguay	68.1
21. Belgium	65.4
22. Slovenia	64.8
23. Spain	63.9
24. Israel	63.6
25. Zambia	63.6
26. Panama	62.4
27. Hungary	62.3
28. Estonia	61.1
29. Botswana	60.6
30. South Korea	58.6
31. Bhutan	58.4
32. Italy	58.1
33. Chile	57.5
34. Laos	57.3
35. Czech Republic	56.1
36. Portugal	56.1
37. Slovakia	56.0
38. Namibia	54.3
39. Latvia	53.7
40. Poland	53.6
41. Paraguay	53.3
42. South Africa	52.1
43. Brazil	51.9
44. Argentina	51.6
45. Lithuania	50.9
46. Uganda	50.5
47. Jordan	50.4
48. Bolivia	49.3
49. Malawi	48.5
50. Greece	48.3
51. Sri Lanka	48.3
52. Albania	47.1
53. Mozambique	46.9
54. Lebanon	46.7
55. Jamaica	46.6
56. Macedonia	46.2
57. Peru	45.9
58. Thailand	45.0
59. Bosnia and Herze.	44.9
60. Madagascar	44.9
61. Central African Rep.	44.8
62. Kyrgyzstan	44.7
63. Zimbabwe	44.4
64. Malaysia	44.2
65. Morocco	43.8
66. Cuba	42.7
67. Armenia	42.6
68. Colombia	42.6
69. Mongolia	42.5
70. Dominican Republic	42.2
71. Mexico	42.1
72. Philippines	42.1
73. Nepal	41.8
74. Cambodia	41.6
75. Honduras	41.6
76. Burundi	40.9
77. India	40.8
78. Tanzania	40.7
79. El Salvador	40.4
80. Oman	40.2
81. Guinea	39.9
82. Ethiopia	39.7
83. Zaire	39.7
84. Papua New Guinea	39.6
85. Chad	39.5
86. Turkey	39.1
87. Guatemala	39.0
88. Rwanda	39.0
89. Burkina Faso	38.8
90. Ghana	38.5
91. Congo	38.3
92. Benin	38.0
93. Bulgaria	37.5
94. Indonesia	37.3
95. Nicaragua	37.3
96. Ecuador	36.9
97. Mali	36.9
98. United Arab Emirates	36.8
99. Kuwait	36.5
100. Cameroon	36.2
101. Kenya	35.7
102. Haiti	35.5
103. Senegal	35.5
104. Sierra Leone	35.5
105. Romania	35.4
106. Tunisia	35.3
107. Guinea-Bissau	34.7
108. Moldova	34.6
109. Togo	34.4
110. Egypt	34.3
111. Ivory Coast	33.9
112. China	33.7
113. Saudi Arabia	33.6
114. Vietnam	33.2
115. Libya	33.0
116. Angola	32.8
117. Gambia	32.7
118. Gabon	32.4
119. Algeria	32.0
120. Pakistan	31.8
121. Trinidad and Tobago	31.6
122. Tajikistan	31.4
123. Venezuela	31.1
124. Byelarus	30.7
125. Niger	30.6
126. Bangladesh	29.8
127. Nigeria	29.4
128. Somalia	29.2
129. Liberia	28.6
130. North Korea	28.1
131. Azerbaijan	27.9
132. Turkmenistan	27.9
133. Kazakhstan	27.7
134. Myanmar (Burma)	27.5
135. Iran	26.9
136. Russia	26.8
137. Mauritania	26.7
138. Syria	26.5
139. Sudan	23.2
140. Uzbekistan	21.0
141. Iraq	20.9
142. Ukraine	20.8

Component: Global Stewardship

1.	Uganda	74.2
2.	Benin	73.0
3.	Malawi	71.8
4.	Bhutan	70.9
5.	Central African Rep.	68.7
6.	Zaire	68.7
7.	Burkina Faso	68.3
8.	Mali	67.6
9.	Congo	67.4
10.	Sweden	67.1
11.	Chad	66.9
12.	Austria	66.7
13.	Ethiopia	66.6
14.	Nepal	66.5
15.	Slovakia	66.5
16.	Niger	66.2
17.	Laos	65.6
18.	Mozambique	65.0
19.	Hungary	65.0
20.	Burundi	64.9
21.	Costa Rica	64.5
22.	Switzerland	64.5
23.	Sri Lanka	63.7
24.	Zambia	63.5
25.	Tanzania	63.5
26.	Papua New Guinea	63.3
27.	Madagascar	63.1
28.	Bolivia	62.5
29.	Ghana	62.2
30.	Paraguay	61.8
31.	Sierra Leone	61.2
32.	Togo	61.0
33.	Morocco	60.7
34.	Uruguay	60.7
35.	Netherlands	60.6
36.	Cameroon	60.4
37.	Sudan	60.2
38.	New Zealand	60.1
39.	Vietnam	60.0
40.	Bangladesh	59.7
41.	Nicaragua	59.6
42.	El Salvador	59.5
43.	Armenia	59.4
44.	Pakistan	59.2
45.	Latvia	59.2
46.	Albania	59.0
47.	Somalia	58.6
48.	Tunisia	58.5
49.	Colombia	58.5
50.	Haiti	58.3
51.	Kenya	58.3
52.	Cambodia	58.3
53.	Namibia	58.1
54.	Ivory Coast	57.9
55.	Senegal	57.6
56.	Belgium	57.2
57.	Egypt	57.0
58.	Botswana	56.7
59.	Jordan	56.1
60.	Slovenia	56.0
61.	Guatemala	55.7
62.	Guinea	55.5
63.	Panama	55.3
64.	Honduras	55.2
65.	Myanmar (Burma)	55.1
66.	Finland	54.9
67.	Ecuador	54.8
68.	Gambia	54.8
69.	France	54.7
70.	Denmark	54.4
71.	Liberia	54.0
72.	Guinea-Bissau	53.9
73.	Zimbabwe	53.9
74.	Macedonia	53.9
75.	Iceland	53.1
76.	Cuba	53.1
77.	Bulgaria	53.0
78.	Rwanda	53.0
79.	Mongolia	52.7
80.	Norway	52.3
81.	Angola	51.8
82.	Israel	50.2
83.	Brazil	50.0
84.	Algeria	49.8
85.	Gabon	49.8
86.	Argentina	49.6
87.	Germany	49.6
88.	Philippines	49.3
89.	Romania	48.7
90.	Mexico	48.7
91.	Ireland	48.6
92.	Croatia	48.5
93.	Mauritania	47.7
94.	Dominican Republic	47.5
95.	Kyrgyzstan	47.2
96.	Italy	46.3
97.	Czech Republic	46.0
98.	Tajikistan	45.6
99.	Indonesia	45.4
100.	Lebanon	45.4
101.	Greece	45.4
102.	Nigeria	45.2
103.	Moldova	45.2
104.	Lithuania	44.9
105.	India	44.3
106.	Syria	44.0
107.	Iran	41.4
108.	Peru	41.2
109.	Portugal	40.9
110.	United Kingdom	40.5
111.	Bosnia and Herze.	40.4
112.	Byelarus	40.2
113.	Thailand	39.6
114.	Canada	39.5
115.	Australia	38.9
116.	Jamaica	38.2
117.	Turkey	38.1
118.	Japan	38.0
119.	Spain	37.3
120.	Malaysia	37.0
121.	Estonia	36.7
122.	Chile	36.4
123.	South Korea	35.1
124.	South Africa	35.0
125.	Poland	34.3
126.	Oman	33.6
127.	Uzbekistan	32.7
128.	Venezuela	30.7
129.	Iraq	29.7
130.	Azerbaijan	27.8
131.	Kazakhstan	27.6
132.	Libya	26.8
133.	Turkmenistan	26.7
134.	United States	24.2
135.	North Korea	20.6
136.	China	18.4
137.	Saudi Arabia	18.2
138.	Ukraine	14.9
139.	Kuwait	14.4
140.	Russia	14.3
141.	Trinidad and Tobago	13.1
142.	United Arab Emirates	9.3

Indicator: Air Quality

Note: 81 countries were missing values for each of the three variables that make up this indicator. Although the estimated values (shown in brackets) are robust when used to generate more highly aggregated measures (of environmental systems or the ESI); they should not be used to compare more narrowly within the air quality indicator, because of the uncertainty associated with the estimate.

1. New Zealand	1.50
2. Australia	1.41
3. Sweden	1.37
4. Malaysia	1.29
5. Cuba	1.29
6. Finland	1.20
7. Trinidad & Tobago	[1.13]
8. Iceland	1.11
9. Sri Lanka	[1.09]
10. Slovakia	1.08
11. Turkey	1.07
12. Ireland	1.05
13. Canada	1.03
14. Switzerland	1.03
15. Namibia	[1.03]
16. Norway	1.02
17. Spain	1.02
18. Czech Republic	1.02
19. Germany	1.00
20. Austria	.99
21. Lithuania	.98
22. Portugal	.84
23. France	.83
24. Byelarus	.81
25. Argentina	.76
26. Denmark	.73
27. Netherlands	.73
28. Lebanon	[.68]
29. Belgium	.67
30. Ecuador	.66
31. Russia	.64
32. Panama	.64
33. Hungary	.63
34. Botswana	[.58]
35. Croatia	.58
36. Dominican Republic	[.58]
37. Macedonia	[.57]
38. Israel	.55
39. Armenia	[.55]
40. Thailand	.54
41. Japan	.53
42. Venezuela	.51
43. South Africa	.48
44. Tanzania	[.48]
45. Latvia	.41
46. Estonia	[.39]
47. Mongolia	[.38]
48. Azerbaijan	[.38]
49. United Kingdom	.37
50. Albania	[.36]
51. Jordan	[.34]
52. United States	.33
53. Romania	.33
54. South Korea	.29
55. North Korea	[.29]
56. Bangladesh	[.28]
57. Uruguay	[.26]
58. Peru	[.23]
59. Oman	[.21]
60. Jamaica	[.19]
61. Bosnia and Herze.	[.13]
62. Nicaragua	.13
63. Zimbabwe	[.10]
64. Kenya	.08
65. Tajikistan	[.07]
66. Philippines	.07
67. India	.06
68. Brazil	.04
69. Kuwait	[.03]
70. Syria	[.03]
71. Tunisia	[.01]
72. Moldova	[.00]
73. Slovenia	[-.02]
74. Chile	-.03
75. Egypt	-.03
76. Poland	-.04
77. Colombia	-.04
78. Honduras	-.11
79. Ukraine	[-.11]
80. Greece	-.15
81. Costa Rica	-.16
82. Libya	[-.17]
83. Indonesia	-.18
84. Ethiopia	[-.18]
85. Vietnam	[-.20]
86. Central African Rep.	[-.21]
87. Haiti	[-.21]
88. Uzbekistan	[-.22]
89. El Salvador	-.22
90. Italy	-.26
91. Sudan	[-.27]
92. Kyrgyzstan	[-.28]
93. Papua New Guinea	[-.28]
94. Nepal	[-.29]
95. Senegal	[-.33]
96. Bolivia	[-.34]
97. Cambodia	[-.40]
98. Burkina Faso	[-.41]
99. Algeria	[-.42]
100. Burundi	[-.43]
101. Ghana	-.48
102. Guatemala	-.49
103. Bhutan	[-.49]
104. Gabon	[-.50]
105. Morocco	[-.57]
106. Chad	[-.59]
107. Laos	[-.59]
108. Kazakhstan	[-.60]
109. Malawi	[-.64]
110. Zaire	[-.67]
111. Mauritania	[-.71]
112. Nigeria	[-.72]
113. Somalia	[-.72]
114. Myanmar (Burma)	[-.80]
115. Paraguay	[-.80]
116. Cameroon	[-.80]
117. Congo	[-.81]
118. Uganda	[-.84]
119. Iran	-.85
120. Turkmenistan	[-.88]
121. Saudi Arabia	[-.89]
122. Guinea	[-.90]
123. United Arab Em.	[-.91]
124. Rwanda	[-.92]
125. Mozambique	[-.93]
126. Gambia	[-.93]
127. Togo	[-1.00]
128. Pakistan	[-1.01]
129. Guinea-Bissau	[-1.02]
130. Bulgaria	-1.03
131. Iraq	[-1.05]
132. Angola	[-1.07]
133. Benin	[-1.11]
134. Madagascar	[-1.15]
135. Mali	[-1.15]
136. Ivory Coast	[-1.18]
137. Zambia	[-1.26]
138. Niger	[-1.27]
139. China	-1.28
140. Liberia	[-1.30]
141. Mexico	-1.54
142. Sierra Leone	[-1.65]

Indicator: Water Quantity

1.	Gabon	3.00
2.	Papua New Guinea	2.30
3.	Canada	1.97
4.	Congo	1.95
5.	Liberia	1.65
6.	Bolivia	1.61
7.	Iceland	1.55
8.	Colombia	1.54
9.	Peru	1.43
10.	Laos	1.41
11.	Angola	1.26
12.	Uruguay	1.26
13.	Norway	1.22
14.	Central African Rep.	1.22
15.	Venezuela	1.19
16.	Brazil	1.16
17.	Paraguay	.94
18.	New Zealand	.76
19.	Cambodia	.70
20.	Zaire	.65
21.	Nicaragua	.57
22.	Sierra Leone	.55
23.	Croatia	.55
24.	Namibia	.51
25.	Argentina	.50
26.	Myanmar (Burma)	.43
27.	Ecuador	.43
28.	Guinea	.43
29.	Bulgaria	.41
30.	Costa Rica	.40
31.	Bhutan	.40
32.	Honduras	.37
33.	Botswana	.35
34.	Bosnia and Herze.	.34
35.	Cameroon	.31
36.	Mozambique	.30
37.	Zambia	.30
38.	Russia	.30
39.	Slovakia	.29
40.	Finland	.29
41.	Slovenia	.28
42.	Latvia	.26
43.	Mongolia	.26
44.	Hungary	.23
45.	Estonia	.22
46.	Turkmenistan	.20
47.	Tajikistan	.20
48.	Bangladesh	.19
49.	Austria	.17
50.	Romania	.17
51.	Benin	.16
52.	Chile	.16
53.	Vietnam	.14
54.	Mauritania	.14
55.	Gambia	.13
56.	Chad	.13
57.	Thailand	.12
58.	Kazakhstan	.09
59.	Mali	.08
60.	Guatemala	.08
61.	Netherlands	.07
62.	Niger	.07
63.	Zimbabwe	.05
64.	Ireland	.04
65.	Lithuania	.04
66.	Sweden	.03
67.	Moldova	.01
68.	Albania	.01
69.	Malaysia	.00
70.	Sudan	-.01
71.	Portugal	-.06
72.	Somalia	-.08
73.	Iraq	-.08
74.	United States	-.09
75.	Ivory Coast	-.10
76.	Byelarus	-.10
77.	Uzbekistan	-.11
78.	Azerbaijan	-.12
79.	Nepal	-.14
80.	Syria	-.18
81.	El Salvador	-.18
82.	Senegal	-.18
83.	Tanzania	-.19
84.	Greece	-.20
85.	Germany	-.24
86.	Togo	-.26
87.	Uganda	-.26
88.	Ghana	-.27
89.	Egypt	-.27
90.	France	-.29
91.	Nigeria	-.31
92.	Rwanda	-.31
93.	Guinea-Bissau	-.31
94.	Burundi	-.31
95.	Indonesia	-.32
96.	Mexico	-.33
97.	Kenya	-.33
98.	United Arab Emirates	-.36
99.	Panama	-.37
100.	Pakistan	-.40
101.	Czech Republic	-.40
102.	Belgium	-.40
103.	Ukraine	-.41
104.	Armenia	-.42
105.	Australia	-.44
106.	North Korea	-.44
107.	Malawi	-.48
108.	India	-.49
109.	Iran	-.49
110.	Madagascar	-.56
111.	Poland	-.60
112.	Turkey	-.63
113.	Tunisia	-.64
114.	Libya	-.66
115.	Jordan	-.70
116.	Dominican Republic	-.72
117.	China	-.74
118.	Haiti	-.74
119.	South Africa	-.78
120.	Burkina Faso	-.81
121.	South Korea	-.82
122.	Italy	-.92
123.	Spain	-.92
124.	Switzerland	-.95
125.	Kyrgyzstan	-.95
126.	United Kingdom	-.99
127.	Philippines	-.99
128.	Ethiopia	-1.00
129.	Jamaica	-1.01
130.	Japan	-1.02
131.	Macedonia	-1.02
132.	Denmark	-1.02
133.	Cuba	-1.03
134.	Algeria	-1.04
135.	Sri Lanka	-1.04
136.	Trinidad and Tobago	-1.04
137.	Oman	-1.06
138.	Lebanon	-1.07
139.	Morocco	-1.07
140.	Israel	-1.07
141.	Saudi Arabia	-1.08
142.	Kuwait	-1.09

Indicator: Water Quality

Note: 73 countries were missing values for each of the four variables that make up this indicator. Although the estimated values (shown in brackets) are robust when used to generate more highly aggregated measures (of environmental systems or the ESI); they should not be used to compare more narrowly within the water quality indicator, due to the uncertainty associated with the estimate.

1. Finland	1.59
2. Canada	1.35
3. New Zealand	1.30
4. United Kingdom	1.25
5. Austria	1.22
6. Latvia	1.18
7. Japan	1.16
8. Norway	1.15
9. Switzerland	1.08
10. Denmark	1.06
11. Russia	1.05
12. France	1.02
13. Sweden	.97
14. Portugal	.96
15. Argentina	.94
16. Hungary	.91
17. Ireland	.87
18. United States	.79
19. Netherlands	.72
20. Albania	.71
21. Slovenia	.68
22. Czech Republic	.67
23. Mali	.65
24. Cuba	.64
25. Brazil	.62
26. Slovakia	.61
27. Botswana	[.58]
28. Moldova	.56
29. Philippines	.55
30. Poland	.51
31. Estonia	.46
32. Romania	.46
33. Ukraine	.44
34. Germany	.43
35. Lithuania	.43
36. Ghana	.42
37. Venezuela	[.40]
38. Iran	.38
39. Ecuador	[.36]
40. Uruguay	[.34]
41. Turkey	.34
42. South Korea	.33
43. Australia	.33
44. Mongolia	[.32]
45. Papua New Guinea	.28
46. Italy	.23
47. Bhutan	[.23]
48. Panama	[.22]
49. Greece	.20
50. Iceland	[.18]
51. Paraguay	[.18]
52. Tanzania	.17
53. Dominican Republic	[.16]
54. Congo	[.14]
55. Malawi	[.13]
56. Israel	[.13]
57. Laos	[.13]
58. Ivory Coast	[.11]
59. Uganda	.10
60. Chad	[.09]
61. Togo	[.08]
62. Tunisia	[.05]
63. Macedonia	[.05]
64. Spain	.05
65. Haiti	[.03]
66. Sri Lanka	[.03]
67. Senegal	.02
68. Colombia	.02
69. Zimbabwe	[.00]
70. Bulgaria	-.01
71. Bangladesh	-.01
72. El Salvador	[-.01]
73. Pakistan	-.05
74. Oman	[-.05]
75. Ethiopia	[-.07]
76. Malaysia	-.08
77. Angola	[-.08]
78. Guatemala	[-.12]
79. Honduras	[-.12]
80. Guinea	[-.12]
81. Croatia	-.13
82. Chile	-.13
83. Trinidad & Tobago	[-.14]
84. Costa Rica	[-.16]
85. Gabon	[-.18]
86. Algeria	[-.18]
87. Peru	[-.18]
88. Sierra Leone	[-.19]
89. Namibia	-.20
90. Vietnam	-.21
91. Zambia	[-.24]
92. Mozambique	[-.24]
93. Somalia	[-.25]
94. China	-.25
95. Burkina Faso	[-.31]
96. Zaire	[-.34]
97. Rwanda	[-.34]
98. Madagascar	[-.34]
99. Kenya	-.35
100. Nicaragua	[-.35]
101. Kyrgyzstan	[-.35]
102. Byelarus	[-.38]
103. Thailand	-.39
104. Syria	[-.40]
105. Kazakhstan	-.41
106. Bolivia	[-.42]
107. Central African Rep.	[-.44]
108. Armenia	[-.47]
109. Cambodia	[-.47]
110. Cameroon	[-.48]
111. Myanmar (Burma)	-.48
112. Niger	[-.49]
113. South Africa	[-.52]
114. Jordan	-.53
115. Mauritania	[-.53]
116. Egypt	[-.55]
117. Liberia	[-.55]
118. Saudi Arabia	[-.56]
119. Indonesia	-.56
120. Iraq	-.66
121. Gambia	[-.66]
122. Morocco	-.69
123. Azerbaijan	[-.69]
124. Mexico	-.70
125. Burundi	[-.72]
126. Uzbekistan	-.73
127. Nigeria	[-.74]
128. Libya	[-.75]
129. Sudan	-.75
130. Lebanon	[-.79]
131. Bosnia and Herze.	[-.86]
132. Benin	[-.86]
133. India	-.90
134. United Arab Em.	[-.92]
135. Nepal	[-.96]
136. North Korea	[-1.04]
137. Jamaica	[-1.06]
138. Kuwait	[-1.10]
139. Guinea-Bissau	[-1.20]
140. Turkmenistan	[-1.33]
141. Belgium	-1.47
142. Tajikistan	[-1.81]

Indicator: Biodiversity

1 .	El Salvador	1.08
2.	Mozambique	1.08
3.	Guinea-Bissau	1.07
4.	Trinidad and Tobago	1.05
5.	Gambia	.96
6.	Guatemala	.91
7.	Togo	.91
8.	Nicaragua	.90
9.	Benin	.90
10.	Burkina Faso	.84
11.	Botswana	.82
12.	Albania	.79
13.	Central African Rep.	.79
14.	Congo	.76
15.	Honduras	.76
16.	Burundi	.76
17.	Senegal	.74
18.	Zimbabwe	.74
19.	Malawi	.73
20.	Zambia	.70
21.	Rwanda	.70
22.	Uganda	.70
23.	Latvia	.69
24.	Ghana	.69
25.	Bolivia	.68
26.	Namibia	.66
27.	Byelarus	.65
28.	Moldova	.65
29.	Venezuela	.61
30.	Gabon	.61
31.	Switzerland	.61
32.	Angola	.61
33.	Guinea	.60
34.	Estonia	.59
35.	Niger	.59
36.	Canada	.57
37.	Costa Rica	.57
38.	Sudan	.56
39.	Lithuania	.55
40.	Paraguay	.55
41.	Kyrgyzstan	.54
42.	Sierra Leone	.53
43.	Armenia	.53
44.	Ivory Coast	.53
45.	Mali	.52
46.	Nigeria	.51
47.	Czech Republic	.50
48.	Finland	.47
49.	Denmark	.44
50.	Uzbekistan	.44
51.	Cameroon	.43
52.	Panama	.43
53.	Slovenia	.43
54.	Syria	.42
55.	Austria	.40
56.	Liberia	.40
57.	Libya	.37
58.	Slovakia	.37
59.	Zaire	.36
60.	Sweden	.32
61.	Croatia	.31
62.	Chad	.30
63.	Somalia	.29
64.	Uruguay	.29
65.	Mongolia	.28
66.	Tajikistan	.27
67.	Bosnia and Herze.	.23
68.	Kazakhstan	.21
69.	Macedonia	.21
70.	Argentina	.18
71.	Hungary	.16
72.	Ecuador	.15
73.	Colombia	.15
74.	Ethiopia	.14
75.	Mauritania	.14
76.	Peru	.13
77.	Lebanon	.12
78.	Azerbaijan	.09
79.	Tunisia	.07
80.	Kenya	.07
81.	Italy	.05
82.	Turkmenistan	.05
83.	Germany	.04
84.	Algeria	.04
85.	Greece	.04
86.	Pakistan	.03
87.	Egypt	.01
88.	Norway	.01
89.	Tanzania	-.01
90.	Jordan	-.04
91.	Turkey	-.04
92.	Ukraine	-.05
93.	Poland	-.05
94.	Belgium	-.05
95.	Myanmar (Burma)	-.06
96.	Ireland	-.07
97.	South Africa	-.10
98.	Nepal	-.12
99.	Laos	-.13
100.	Mexico	-.13
101.	United States	-.14
102.	Morocco	-.14
103.	France	-.14
104.	Thailand	-.16
105.	Iraq	-.17
106.	Iran	-.18
107.	Israel	-.18
108.	Netherlands	-.21
109.	Bhutan	-.27
110.	Saudi Arabia	-.30
111.	Bulgaria	-.32
112.	United Kingdom	-.32
113.	Romania	-.33
114.	Russia	-.33
115.	Cambodia	-.43
116.	Malaysia	-.46
117.	Vietnam	-.48
118.	China	-.59
119.	Brazil	-.67
120.	Chile	-.68
121.	Oman	-.68
122.	United Arab Emirates	-.69
123.	Sri Lanka	-.71
124.	Bangladesh	-.72
125.	Australia	-.73
126.	Portugal	-.74
127.	Spain	-.80
128.	Papua New Guinea	-.84
129.	Jamaica	-1.09
130.	India	-1.17
131.	Japan	-1.23
132.	Indonesia	-1.35
133.	Dominican Republic	-1.37
134.	Iceland	-1.42
135.	Kuwait	-1.84
136.	Cuba	-2.20
137.	Madagascar	-2.22
138.	North Korea	-2.40
139.	South Korea	-2.57
140.	Haiti	-3.25
141.	Philippines	-3.43
142.	New Zealand	-4.16

Indicator: Land

1	Libya	1.66
2	Iceland	1.65
3	Mauritania	1.64
4	Algeria	1.63
5	Canada	1.60
6	Niger	1.52
7	Australia	1.50
8	Gabon	1.50
9	Congo	1.47
10	Mongolia	1.45
11	Botswana	1.39
12	Namibia	1.37
13	Egypt	1.32
14	Russia	1.28
15	Bolivia	1.25
16	Chad	1.23
17	Mali	1.23
18	Oman	1.08
19	Central African Rep.	1.06
20	Venezuela	1.01
21	Brazil	.96
22	Colombia	.93
23	Peru	.92
24	Saudi Arabia	.90
25	Angola	.90
26	Paraguay	.89
27	Sudan	.85
28	Kazakhstan	.79
29	Kenya	.76
30	Papua New Guinea	.73
31	Chile	.71
32	Argentina	.59
33	Uzbekistan	.50
34	Zambia	.48
35	New Zealand	.47
36	China	.45
37	Turkmenistan	.43
38	Finland	.43
39	Mozambique	.41
40	Norway	.39
41	Zaire	.39
42	United States	.38
43	Ecuador	.38
44	Somalia	.38
45	Malaysia	.37
46	Tajikistan	.33
47	Madagascar	.32
48	Tunisia	.31
49	Ethiopia	.31
50	Malawi	.30
51	Morocco	.29
52	South Africa	.26
53	Myanmar (Burma)	.24
54	Sweden	.24
55	Kyrgyzstan	.23
56	Mexico	.22
57	Cambodia	.22
58	Uganda	.18
59	Tanzania	.17
60	Cameroon	.17
61	Indonesia	.16
62	Laos	.14
63	Guatemala	.11
64	Liberia	.10
65	Burundi	.08
66	Nicaragua	.08
67	Ivory Coast	.06
68	Rwanda	.06
69	Bhutan	.05
70	Benin	.04
71	Iraq	.03
72	Burkina Faso	.02
73	Iran	.01
74	Honduras	.01
75	Jordan	.00
76	Panama	-.02
77	Senegal	-.02
78	Nepal	-.04
79	Guinea	-.05
80	Nigeria	-.06
81	Zimbabwe	-.07
82	Ghana	-.07
83	Syria	-.09
84	Togo	-.09
85	Thailand	-.11
86	United Arab Emirates	-.13
87	Turkey	-.13
88	Armenia	-.14
89	Guinea-Bissau	-.16
90	Pakistan	-.17
91	Uruguay	-.17
92	Vietnam	-.17
93	Sierra Leone	-.24
94	Dominican Republic	-.31
95	Albania	-.32
96	Kuwait	-.37
97	Bosnia and Herze.	-.37
98	Azerbaijan	-.38
99	Haiti	-.39
100	Costa Rica	-.45
101	Philippines	-.47
102	Spain	-.49
103	India	-.51
104	Portugal	-.57
105	Moldova	-.59
106	Byelarus	-.59
107	El Salvador	-.66
108	Greece	-.67
109	Macedonia	-.68
110	Estonia	-.69
111	North Korea	-.73
112	Gambia	-.73
113	Lithuania	-.76
114	Ukraine	-.79
115	Lebanon	-.79
116	Slovenia	-.80
117	Israel	-.80
118	Bulgaria	-.85
119	Romania	-.86
120	Croatia	-.89
121	Latvia	-.89
122	Bangladesh	-.89
123	Austria	-.92
124	Sri Lanka	-.93
125	Ireland	-.99
126	Jamaica	-1.00
127	Trinidad and Tobago	-1.02
128	Cuba	-1.14
129	South Korea	-1.15
130	Slovakia	-1.18
131	Poland	-1.28
132	Italy	-1.32
133	France	-1.34
134	Czech Republic	-1.44
135	Hungary	-1.46
136	Switzerland	-1.46
137	Japan	-1.67
138	United Kingdom	-1.77
139	Germany	-1.82
140	Denmark	-1.98
141	Belgium	-1.98
142	Netherlands	-1.98

Indicator: Reducing Air Pollution

1	Papua New Guinea	.66
2.	Haiti	.63
3.	Somalia	.63
4.	Bhutan	.61
5.	Guinea	.60
6.	Nicaragua	.60
7.	Madagascar	.59
8.	Mali	.59
9.	Panama	.59
10.	Uruguay	.58
11.	Latvia	.58
12.	Peru	.57
13.	Costa Rica	.56
14.	Kyrgyzstan	.56
15.	Gabon	.56
16.	Guinea-Bissau	.56
17.	Mozambique	.56
18.	Ethiopia	.55
19.	Chad	.55
20.	Niger	.54
21.	Argentina	.54
22.	Benin	.54
23.	Albania	.54
24.	Myanmar (Burma)	.53
25.	Burkina Faso	.53
26.	Mauritania	.53
27.	Dominican Republic	.52
28.	Cameroon	.52
29.	Oman	.52
30.	Kazakhstan	.51
31.	Iran	.51
32.	Morocco	.51
33.	Senegal	.51
34.	Malawi	.50
35.	Laos	.50
36.	Bolivia	.50
37.	Mongolia	.50
38.	Turkmenistan	.50
39.	Honduras	.50
40.	Tanzania	.49
41.	Togo	.48
42.	Zaire	.48
43.	Sudan	.47
44.	Sri Lanka	.47
45.	Estonia	.46
46.	Zimbabwe	.46
47.	Liberia	.45
48.	El Salvador	.45
49.	Pakistan	.43
50.	Ivory Coast	.43
51.	Congo	.43
52.	Indonesia	.42
53.	Gambia	.41
54.	Uzbekistan	.41
55.	Cuba	.41
56.	Angola	.39
57.	Kenya	.39
58.	Moldova	.39
59.	Ghana	.38
60.	Byelarus	.38
61.	Uganda	.37
62.	Syria	.37
63.	Guatemala	.37
64.	New Zealand	.36
65.	Norway	.36
66.	Burundi	.36
67.	Ecuador	.36
68.	Paraguay	.36
69.	Tunisia	.34
70.	Brazil	.33
71.	Tajikistan	.33
72.	Sweden	.33
73.	Colombia	.31
74.	Bosnia and Herze.	.30
75.	Turkey	.30
76.	Finland	.28
77.	Iraq	.27
78.	Azerbaijan	.25
79.	Philippines	.24
80.	Nigeria	.24
81.	Sierra Leone	.22
82.	Lithuania	.22
83.	Malaysia	.22
84.	Jordan	.22
85.	Croatia	.20
86.	Russia	.20
87.	Vietnam	.20
88.	Saudi Arabia	.19
89.	Central African Rep.	.18
90.	Mexico	.17
91.	Thailand	.17
92.	Macedonia	.16
93.	Ireland	.15
94.	Zambia	.14
95.	Chile	.13
96.	Venezuela	.13
97.	Algeria	.12
98.	Armenia	.12
99.	Nepal	.09
100.	Rwanda	.08
101.	Romania	.05
102.	Portugal	.05
103.	Trinidad and Tobago	.02
104.	Cambodia	.01
105.	India	-.05
106.	Bangladesh	-.07
107.	Spain	-.07
108.	Ukraine	-.12
109.	Hungary	-.19
110.	Greece	-.20
111.	Slovenia	-.20
112.	Bulgaria	-.25
113.	China	-.27
114.	Austria	-.27
115.	South Africa	-.37
116.	Slovakia	-.39
117.	France	-.53
118.	Switzerland	-.55
119.	Jamaica	-.65
120.	Canada	-.75
121.	Poland	-.78
122.	United States	-.82
123.	Namibia	-.84
124.	Lebanon	-.97
125.	Denmark	-1.00
126.	Italy	-1.06
127.	Kuwait	-1.19
128.	Australia	-1.22
129.	Egypt	-1.25
130.	Botswana	-1.25
131.	Israel	-1.33
132.	United Arab Emirates	-1.36
133.	Iceland	-1.38
134.	Czech Republic	-1.45
135.	Libya	-1.71
136.	North Korea	-1.75
137.	Japan	-2.17
138.	Netherlands	-2.28
139.	South Korea	-2.51
140.	Germany	-2.55
141.	United Kingdom	-2.74
142.	Belgium	-3.87

Indicator: Reducing Water Stress

1.	Myanmar (Burma)	.95
2.	Mozambique	.90
3.	Cameroon	.78
4.	Central African Rep.	.76
5.	Uganda	.76
6.	Angola	.76
7.	Guinea	.75
8.	Gambia	.75
9.	Togo	.74
10.	Rwanda	.74
11.	Madagascar	.74
12.	Guinea-Bissau	.74
13.	Laos	.74
14.	Burundi	.74
15.	Haiti	.74
16.	Burkina Faso	.74
17.	Zambia	.72
18.	Chad	.71
19.	Mali	.71
20.	Bhutan	.70
21.	Tanzania	.70
22.	Estonia	.70
23.	Nicaragua	.69
24.	Congo	.67
25.	Benin	.63
26.	Canada	.60
27.	Mauritania	.59
28.	Uruguay	.59
29.	Botswana	.58
30.	Bosnia and Herze.	.57
31.	Paraguay	.57
32.	Russia	.57
33.	Senegal	.56
34.	Ivory Coast	.56
35.	Mongolia	.55
36.	Ghana	.54
37.	Latvia	.54
38.	Venezuela	.53
39.	Romania	.53
40.	North Korea	.52
41.	Ethiopia	.50
42.	Zaire	.50
43.	Gabon	.48
44.	Bolivia	.48
45.	Brazil	.48
46.	Indonesia	.47
47.	Liberia	.47
48.	Ecuador	.47
49.	Thailand	.47
50.	Lithuania	.46
51.	Guatemala	.46
52.	Sudan	.45
53.	Moldova	.44
54.	Albania	.44
55.	Cambodia	.43
56.	Sweden	.43
57.	Zimbabwe	.41
58.	Dominican Republic	.39
59.	Panama	.39
60.	Australia	.38
61.	Finland	.36
62.	Argentina	.36
63.	Kenya	.32
64.	Sierra Leone	.31
65.	Norway	.30
66.	Peru	.30
67.	Somalia	.26
68.	Bangladesh	.25
69.	Croatia	.25
70.	Poland	.24
71.	Hungary	.23
72.	Slovakia	.20
73.	Czech Republic	.20
74.	Malawi	.19
75.	Byelarus	.19
76.	Nigeria	.17
77.	Bulgaria	.17
78.	El Salvador	.16
79.	Ukraine	.16
80.	Austria	.14
81.	Papua New Guinea	.13
82.	Germany	.09
83.	Philippines	.08
84.	Niger	.07
85.	Cuba	.07
86.	United States	.06
87.	Honduras	.01
88.	Jamaica	.00
89.	Mexico	-.02
90.	Denmark	-.03
91.	Colombia	-.04
92.	New Zealand	-.06
93.	Nepal	-.07
94.	Turkey	-.09
95.	Kazakhstan	-.09
96.	Namibia	-.12
97.	South Africa	-.12
98.	Chile	-.17
99.	Algeria	-.18
100.	India	-.19
101.	Armenia	-.20
102.	France	-.22
103.	Pakistan	-.23
104.	Portugal	-.26
105.	Morocco	-.27
106.	Slovenia	-.36
107.	Kyrgyzstan	-.39
108.	Iran	-.40
109.	Jordan	-.45
110.	Greece	-.46
111.	Iraq	-.47
112.	United Kingdom	-.48
113.	Azerbaijan	-.49
114.	Spain	-.56
115.	China	-.56
116.	Japan	-.58
117.	Saudi Arabia	-.59
118.	Libya	-.61
119.	Tunisia	-.62
120.	Vietnam	-.64
121.	Uzbekistan	-.66
122.	Tajikistan	-.70
123.	Sri Lanka	-.71
124.	Syria	-.76
125.	Egypt	-.82
126.	Macedonia	-.85
127.	Malaysia	-.89
128.	Ireland	-.90
129.	Turkmenistan	-.93
130.	Switzerland	-.96
131.	Israel	-1.20
132.	Netherlands	-1.26
133.	Iceland	-1.35
134.	Italy	-1.43
135.	Belgium	-1.47
136.	Lebanon	-1.48
137.	Oman	-1.54
138.	Trinidad and Tobago	-1.55
139.	South Korea	-1.61
140.	Costa Rica	-1.64
141.	Kuwait	-2.79
142.	United Arab Emirates	-2.87

Indicator: Reducing Ecosystem Stress

1.	Israel	1.47
2.	Oman	1.47
3.	Kuwait	1.47
4.	Egypt	1.44
5.	United Arab Emirates	1.27
6.	Byelarus	1.25
7.	Kyrgyzstan	1.20
8.	Kazakhstan	1.07
9.	Iceland	1.07
10.	Portugal	.80
11.	Libya	.79
12.	Bangladesh	.76
13.	Cuba	.76
14.	Algeria	.76
15.	Armenia	.76
16.	Azerbaijan	.76
17.	Gambia	.66
18.	Greece	.54
19.	Estonia	.52
20.	Venezuela	.49
21.	New Zealand	.49
22.	Tajikistan	.49
23.	Spain	.41
24.	Latvia	.39
25.	Uruguay	.39
26.	Lithuania	.39
27.	Moldova	.39
28.	Tunisia	.39
29.	Turkey	.38
30.	India	.35
31.	Uzbekistan	.35
32.	Bhutan	.32
33.	Gabon	.32
34.	Dominican Republic	.32
35.	Morocco	.32
36.	Iran	.32
37.	Jordan	.32
38.	Iraq	.32
39.	Saudi Arabia	.32
40.	Syria	.32
41.	Turkmenistan	.32
42.	Russia	.31
43.	Hungary	.30
44.	Ukraine	.29
45.	Central African Rep.	.28
46.	Congo	.28
47.	South Africa	.28
48.	Chile	.28
49.	Finland	.28
50.	Australia	.26
51.	Mozambique	.25
52.	Burkina Faso	.25
53.	Tanzania	.25
54.	China	.24
55.	North Korea	.24
56.	Bolivia	.22
57.	Croatia	.21
58.	Angola	.19
59.	Brazil	.18
60.	Peru	.18
61.	Papua New Guinea	.18
62.	Colombia	.18
63.	Lebanon	.18
64.	Zaire	.17
65.	Canada	.15
66.	Guinea	.15
67.	Paraguay	.15
68.	Mongolia	.15
69.	Kenya	.15
70.	Chad	.11
71.	Bulgaria	.09
72.	Mali	.08
73.	Senegal	.08
74.	Thailand	.07
75.	Ethiopia	.05
76.	Argentina	.05
77.	Trinidad and Tobago	.05
78.	Costa Rica	.05
79.	Cameroon	.01
80.	Madagascar	.01
81.	Guinea-Bissau	.01
82.	Botswana	.01
83.	Cambodia	.01
84.	Namibia	.01
85.	Japan	-.02
86.	Somalia	-.02
87.	Honduras	-.02
88.	Albania	-.03
89.	Norway	-.04
90.	United States	-.04
91.	Mexico	-.08
92.	Ecuador	-.09
93.	Malaysia	-.09
94.	France	-.13
95.	Italy	-.13
96.	Sudan	-.16
97.	Philippines	-.16
98.	Myanmar (Burma)	-.18
99.	Zimbabwe	-.19
100.	Jamaica	-.19
101.	Pakistan	-.19
102.	Romania	-.21
103.	Slovakia	-.21
104.	Panama	-.23
105.	Sri Lanka	-.23
106.	Ghana	-.26
107.	Guatemala	-.26
108.	Nepal	-.29
109.	Ireland	-.32
110.	Indonesia	-.34
111.	Uganda	-.36
112.	Liberia	-.36
113.	Benin	-.46
114.	Malawi	-.50
115.	Nigeria	-.57
116.	Mauritania	-.60
117.	Zambia	-.66
118.	Sierra Leone	-.67
119.	Vietnam	-.67
120.	Switzerland	-.68
121.	Nicaragua	-.70
122.	Laos	-.72
123.	Bosnia and Herze.	-.73
124.	Ivory Coast	-.74
125.	Sweden	-.74
126.	Togo	-.84
127.	Slovenia	-.85
128.	United Kingdom	-.88
129.	Netherlands	-.93
130.	Niger	-.94
131.	Rwanda	-1.01
132.	Burundi	-1.11
133.	Haiti	-1.11
134.	El Salvador	-1.11
135.	Austria	-1.17
136.	Poland	-1.26
137.	Germany	-1.28
138.	Denmark	-1.30
139.	South Korea	-1.52
140.	Czech Republic	-1.71
141.	Macedonia	-1.71
142.	Belgium	-1.78

Indicator: Reducing Waste and Consumption Pressures

1.	Bangladesh	.95
2.	Zaire	.95
3.	Namibia	.95
4.	Sierra Leone	.94
5.	Chad	.93
6.	Burundi	.93
7.	Mozambique	.93
8.	Haiti	.92
9.	Bhutan	.92
10.	Guinea-Bissau	.91
11.	Angola	.90
12.	Togo	.90
13.	Cambodia	.90
14.	Guinea	.89
15.	Ethiopia	.89
16.	Mali	.89
17.	Malawi	.88
18.	Uganda	.88
19.	Cameroon	.88
20.	Tajikistan	.87
21.	Burkina Faso	.87
22.	Rwanda	.87
23.	Laos	.87
24.	Madagascar	.86
25.	Sri Lanka	.85
26.	Vietnam	.85
27.	Ivory Coast	.85
28.	Somalia	.84
29.	Benin	.84
30.	Niger	.84
31.	Gambia	.83
32.	Nepal	.83
33.	Tanzania	.82
34.	Senegal	.81
35.	Myanmar (Burma)	.80
36.	Pakistan	.79
37.	Central African Rep.	.78
38.	Ghana	.78
39.	Sudan	.77
40.	Congo	.77
41.	Kenya	.77
42.	Armenia	.77
43.	Liberia	.77
44.	Zambia	.75
45.	Mauritania	.74
46.	Nicaragua	.73
47.	Bolivia	.71
48.	Bosnia and Herze.	.71
49.	Nigeria	.70
50.	Peru	.70
51.	Dominican Republic	.68
52.	Papua New Guinea	.67
53.	Philippines	.66
54.	Honduras	.66
55.	Zimbabwe	.65
56.	El Salvador	.61
57.	Morocco	.60
58.	Botswana	.55
59.	Jordan	.54
60.	Iraq	.53
61.	Algeria	.51
62.	Guatemala	.51
63.	Indonesia	.50
64.	China	.49
65.	Kyrgyzstan	.48
66.	Colombia	.47
67.	North Korea	.46
68.	Egypt	.44
69.	India	.44
70.	Albania	.41
71.	Gabon	.40
72.	Cuba	.36
73.	Azerbaijan	.35
74.	Tunisia	.33
75.	Ecuador	.32
76.	Iran	.29
77.	Croatia	.28
78.	Panama	.28
79.	Brazil	.27
80.	Thailand	.26
81.	Uzbekistan	.25
82.	Turkey	.25
83.	Trinidad and Tobago	.25
84.	Mexico	.24
85.	Moldova	.23
86.	Syria	.20
87.	Jamaica	.15
88.	Chile	.12
89.	Costa Rica	.11
90.	Paraguay	.08
91.	Romania	.08
92.	Venezuela	.07
93.	Malaysia	.04
94.	Argentina	.03
95.	Bulgaria	-.04
96.	Slovakia	-.05
97.	Lebanon	-.06
98.	Macedonia	-.08
99.	South Africa	-.08
100.	Oman	-.14
101.	Portugal	-.21
102.	Hungary	-.22
103.	Turkmenistan	-.23
104.	Latvia	-.28
105.	Byelarus	-.28
106.	Lithuania	-.29
107.	Slovenia	-.29
108.	Poland	-.30
109.	South Korea	-.36
110.	Spain	-.36
111.	Netherlands	-.38
112.	Italy	-.39
113.	Belgium	-.41
114.	Norway	-.44
115.	Mongolia	-.51
116.	Czech Republic	-.51
117.	Libya	-.53
118.	Switzerland	-.56
119.	Kazakhstan	-.57
120.	Estonia	-.64
121.	Germany	-.74
122.	Uruguay	-.75
123.	Sweden	-.78
124.	Finland	-.92
125.	Australia	-.92
126.	Russia	-.94
127.	Israel	-.95
128.	Austria	-.97
129.	Greece	-1.03
130.	Japan	-1.17
131.	Denmark	-1.20
132.	Iceland	-1.20
133.	Canada	-1.24
134.	Saudi Arabia	-1.26
135.	France	-1.91
136.	United States	-2.23
137.	Ukraine	-2.43
138.	Ireland	-2.58
139.	United Kingdom	-2.59
140.	New Zealand	-2.63
141.	Kuwait	-2.84
142.	United Arab Emirates	-2.84

Indicator: Reducing Population Growth

1.	Latvia	1.24
2.	Bulgaria	1.22
3.	Ukraine	1.22
4.	Spain	1.21
5.	Estonia	1.21
6.	Italy	1.18
7.	Japan	1.16
8.	Slovenia	1.15
9.	Hungary	1.15
10.	Czech Republic	1.13
11.	Lithuania	1.13
12.	Russia	1.12
13.	Byelarus	1.12
14.	Romania	1.12
15.	Slovakia	1.12
16.	Germany	1.12
17.	Croatia	1.11
18.	Greece	1.10
19.	Portugal	1.10
20.	Poland	1.09
21.	Armenia	1.07
22.	Austria	1.02
23.	Moldova	1.01
24.	Cuba	.97
25.	Finland	.97
26.	Switzerland	.96
27.	Belgium	.96
28.	Bosnia and Herze.	.96
29.	South Korea	.94
30.	Kazakhstan	.92
31.	Sweden	.91
32.	United Kingdom	.88
33.	Trinidad and Tobago	.88
34.	Canada	.86
35.	Macedonia	.84
36.	Netherlands	.84
37.	China	.84
38.	France	.80
39.	Denmark	.79
40.	Thailand	.78
41.	Norway	.77
42.	South Africa	.77
43.	Ireland	.74
44.	Iceland	.72
45.	Australia	.71
46.	Sri Lanka	.68
47.	New Zealand	.64
48.	North Korea	.62
49.	Turkmenistan	.58
50.	Chile	.58
51.	Azerbaijan	.55
52.	Uruguay	.53
53.	United States	.50
54.	Botswana	.50
55.	Lebanon	.46
56.	Tajikistan	.45
57.	Tunisia	.43
58.	Zimbabwe	.43
59.	Brazil	.42
60.	Vietnam	.41
61.	Jamaica	.40
62.	Turkey	.38
63.	Kyrgyzstan	.37
64.	Mongolia	.36
65.	Argentina	.35
66.	Panama	.34
67.	Costa Rica	.32
68.	Iran	.32
69.	Indonesia	.32
70.	Albania	.27
71.	Mexico	.27
72.	Uzbekistan	.23
73.	Colombia	.22
74.	Myanmar (Burma)	.18
75.	Peru	.16
76.	Venezuela	.15
77.	Israel	.12
78.	India	.11
79.	Bangladesh	.09
80.	Algeria	.09
81.	United Arab Emirates	.06
82.	Dominican Republic	.04
83.	Cambodia	.03
84.	Kenya	.02
85.	Morocco	.01
86.	Egypt	-.02
87.	Philippines	-.05
88.	Gabon	-.12
89.	Malaysia	-.14
90.	Ecuador	-.15
91.	Ghana	-.20
92.	El Salvador	-.21
93.	Namibia	-.23
94.	Mozambique	-.27
95.	Rwanda	-.35
96.	Honduras	-.38
97.	Haiti	-.38
98.	Libya	-.41
99.	Syria	-.45
100.	Bolivia	-.46
101.	Jordan	-.49
102.	Central African Rep.	-.54
103.	Laos	-.58
104.	Nicaragua	-.64
105.	Sudan	-.64
106.	Nepal	-.69
107.	Papua New Guinea	-.79
108.	Togo	-.81
109.	Ivory Coast	-.85
110.	Cameroon	-.86
111.	Paraguay	-.86
112.	Guatemala	-.91
113.	Iraq	-.94
114.	Kuwait	-1.00
115.	Zambia	-1.01
116.	Bhutan	-1.02
117.	Guinea	-1.07
118.	Pakistan	-1.09
119.	Senegal	-1.10
120.	Malawi	-1.11
121.	Tanzania	-1.12
122.	Nigeria	-1.15
123.	Guinea-Bissau	-1.33
124.	Ethiopia	-1.36
125.	Saudi Arabia	-1.46
126.	Angola	-1.47
127.	Burundi	-1.47
128.	Madagascar	-1.49
129.	Benin	-1.54
130.	Gambia	-1.57
131.	Sierra Leone	-1.63
132.	Mauritania	-1.68
133.	Burkina Faso	-1.71
134.	Niger	-1.74
135.	Oman	-1.79
136.	Liberia	-1.85
137.	Congo	-2.01
138.	Chad	-2.09
139.	Mali	-2.12
140.	Uganda	-2.16
141.	Zaire	-2.18
142.	Somalia	-2.19

Indicator: Basic Human Sustenance

1.	Slovenia	1.06
2.	Byelarus	1.06
3.	Slovakia	1.06
4.	Austria	1.06
5.	Finland	1.06
6.	Switzerland	1.06
7.	Sweden	1.06
8.	United Kingdom	1.06
9.	Canada	1.06
10.	Netherlands	1.06
11.	Denmark	1.06
12.	Norway	1.06
13.	Australia	1.06
14.	United States	1.06
15.	Lebanon	1.06
16.	Hungary	1.03
17.	Ireland	.98
18.	Iceland	.97
19.	Uruguay	.94
20.	Saudi Arabia	.93
21.	Japan	.92
22.	Costa Rica	.88
23.	Russia	.88
24.	Italy	.86
25.	South Korea	.85
26.	New Zealand	.84
27.	France	.84
28.	Egypt	.84
29.	Jordan	.83
30.	Greece	.81
31.	Chile	.81
32.	Iran	.80
33.	Moldova	.78
34.	Bulgaria	.75
35.	Algeria	.75
36.	Belgium	.74
37.	Germany	.73
38.	Spain	.72
39.	Israel	.71
40.	Latvia	.70
41.	Macedonia	.69
42.	Czech Republic	.65
43.	Malaysia	.62
44.	Turkey	.61
45.	United Arab Emirates	.60
46.	Portugal	.59
47.	Poland	.58
48.	Uzbekistan	.57
49.	Mexico	.57
50.	Tunisia	.53
51.	Syria	.53
52.	Kazakhstan	.52
53.	Argentina	.51
54.	Estonia	.51
55.	Kuwait	.47
56.	Turkmenistan	.46
57.	Croatia	.46
58.	Colombia	.45
59.	Brazil	.44
60.	Ukraine	.44
61.	Cuba	.44
62.	Morocco	.43
63.	South Africa	.36
64.	Libya	.32
65.	Trinidad and Tobago	.32
66.	Indonesia	.28
67.	Iraq	.27
68.	Panama	.26
69.	Botswana	.25
70.	Pakistan	.22
71.	Guatemala	.20
72.	Honduras	.18
73.	Ecuador	.18
74.	Bosnia and Herze.	.18
75.	China	.16
76.	Kyrgyzstan	.15
77.	Paraguay	.12
78.	Peru	.09
79.	Jamaica	.08
80.	India	.07
81.	El Salvador	.04
82.	Myanmar (Burma)	.03
83.	Gabon	.03
84.	Venezuela	.03
85.	Philippines	.01
86.	Bangladesh	.00
87.	Ivory Coast	-.01
88.	Laos	-.03
89.	Romania	-.04
90.	Sri Lanka	-.06
91.	Thailand	-.08
92.	Nepal	-.11
93.	Bolivia	-.14
94.	Lithuania	-.17
95.	Albania	-.20
96.	North Korea	-.20
97.	Sudan	-.21
98.	Senegal	-.22
99.	Dominican Republic	-.23
100.	Nigeria	-.25
101.	Ghana	-.32
102.	Benin	-.34
103.	Nicaragua	-.35
104.	Gambia	-.37
105.	Zimbabwe	-.50
106.	Namibia	-.53
107.	Armenia	-.59
108.	Azerbaijan	-.60
109.	Togo	-.64
110.	Vietnam	-.65
111.	Cameroon	-.67
112.	Mali	-.69
113.	Mongolia	-.69
114.	Tajikistan	-.83
115.	Bhutan	-.84
116.	Burkina Faso	-.88
117.	Mauritania	-.90
118.	Uganda	-1.08
119.	Malawi	-1.11
120.	Oman	-1.16
121.	Congo	-1.18
122.	Papua New Guinea	-1.23
123.	Niger	-1.24
124.	Central African Rep.	-1.28
125.	Guinea	-1.29
126.	Zambia	-1.30
127.	Madagascar	-1.53
128.	Tanzania	-1.53
129.	Guinea-Bissau	-1.55
130.	Mozambique	-1.62
131.	Burundi	-1.65
132.	Kenya	-1.66
133.	Liberia	-1.67
134.	Rwanda	-1.69
135.	Chad	-1.81
136.	Somalia	-1.84
137.	Cambodia	-1.88
138.	Sierra Leone	-2.03
139.	Haiti	-2.05
140.	Angola	-2.10
141.	Zaire	-2.18
142.	Ethiopia	-2.27

Indicator: Environmental Health

1. Austria	1.03	49. United States	.65	97. Egypt	-.22
2. Germany	1.02	50. Armenia	.64	98. Gambia	-.28
3. Netherlands	1.02	51. Latvia	.63	99. India	-.38
4. Italy	1.02	52. Malaysia	.61	100. Bangladesh	-.49
5. Sweden	1.02	53. North Korea	.60	101. Papua New Guinea	-.60
6. Canada	1.02	54. Macedonia	.58	102. Ghana	-.60
7. Portugal	1.01	55. Panama	.58	103. Pakistan	-.65
8. Slovenia	1.01	56. Byelarus	.57	104. Laos	-.72
9. Greece	1.01	57. Kazakhstan	.57	105. Tajikistan	-.74
10. Czech Republic	1.01	58. Thailand	.53	106. Haiti	-.78
11. Spain	1.01	59. Bosnia and Herze.	.53	107. Senegal	-.79
12. Australia	1.01	60. Jamaica	.50	108. Nepal	-.85
13. Israel	1.01	61. Saudi Arabia	.50	109. Turkmenistan	-.86
14. New Zealand	1.01	62. Azerbaijan	.48	110. Sudan	-.87
15. Finland	1.00	63. China	.45	111. Kenya	-.89
16. France	1.00	64. Tunisia	.44	112. Cambodia	-.90
17. Belgium	1.00	65. Paraguay	.42	113. Myanmar (Burma)	-.94
18. Ireland	1.00	66. Syria	.40	114. Uganda	-.95
19. United Kingdom	1.00	67. Ecuador	.39	115. Tanzania	-1.04
20. Norway	1.00	68. Honduras	.39	116. Iraq	-1.10
21. Poland	.99	69. Brazil	.38	117. Togo	-1.17
22. Iceland	.99	70. Sri Lanka	.38	118. Benin	-1.27
23. Croatia	.99	71. Venezuela	.37	119. Madagascar	-1.30
24. Hungary	.98	72. Mexico	.32	120. Gabon	-1.34
25. Kuwait	.97	73. Philippines	.31	121. Central African Rep.	-1.36
26. South Korea	.96	74. Dominican Republic	.30	122. Cameroon	-1.39
27. Slovakia	.95	75. Libya	.30	123. Burundi	-1.40
28. Switzerland	.95	76. Iran	.29	124. Rwanda	-1.40
29. Lithuania	.93	77. Lebanon	.28	125. Guinea	-1.51
30. Estonia	.92	78. Jordan	.27	126. Ivory Coast	-1.51
31. Japan	.92	79. Turkey	.25	127. Nigeria	-1.56
32. Bulgaria	.87	80. Nicaragua	.13	128. Mozambique	-1.59
33. Chile	.87	81. Indonesia	.10	129. Burkina Faso	-1.65
34. Argentina	.85	82. Morocco	.09	130. Ethiopia	-1.67
35. Ukraine	.82	83. South Africa	.03	131. Zambia	-1.67
36. Uruguay	.82	84. Algeria	-.02	132. Zaire	-1.68
37. Trinidad and Tobago	.81	85. Kyrgyzstan	-.03	133. Mauritania	-1.70
38. Russia	.78	86. Peru	-.03	134. Chad	-1.73
39. Denmark	.77	87. Zimbabwe	-.05	135. Guinea-Bissau	-1.73
40. Cuba	.76	88. Uzbekistan	-.05	136. Malawi	-1.78
41. United Arab Emirates	.75	89. Namibia	-.06	137. Somalia	-1.79
42. Costa Rica	.73	90. Guatemala	-.09	138. Liberia	-1.86
43. Moldova	.71	91. El Salvador	-.10	139. Mali	-1.96
44. Oman	.70	92. Bhutan	-.13	140. Sierra Leone	-2.02
45. Colombia	.69	93. Congo	-.16	141. Niger	-2.02
46. Romania	.69	94. Bolivia	-.19	142. Angola	-2.05
47. Albania	.69	95. Mongolia	-.20		
48. Vietnam	.67	96. Botswana	-.20		

Indicator: Science & Technology

1.	United States	2.06
2.	Finland	1.84
3.	Sweden	1.80
4.	Canada	1.59
5.	Switzerland	1.58
6.	Japan	1.52
7.	Australia	1.52
8.	Norway	1.49
9.	Germany	1.44
10.	Netherlands	1.41
11.	South Korea	1.39
12.	United Kingdom	1.37
13.	Denmark	1.25
14.	New Zealand	1.22
15.	Ireland	1.19
16.	Israel	1.19
17.	Belgium	1.15
18.	Iceland	1.04
19.	France	1.03
20.	Austria	1.01
21.	Czech Republic	.74
22.	Cuba	.71
23.	Hungary	.67
24.	Spain	.63
25.	Slovakia	.59
26.	Italy	.59
27.	United Arab Emirates	.57
28.	Poland	.55
29.	Estonia	.53
30.	Oman	.45
31.	Lebanon	.42
32.	Libya	.42
33.	Greece	.39
34.	Jordan	.37
35.	Slovenia	.36
36.	Turkmenistan	.34
37.	Bulgaria	.34
38.	Bosnia and Herze.	.30
39.	Lithuania	.28
40.	Argentina	.26
41.	Morocco	.26
42.	Latvia	.25
43.	Romania	.22
44.	Portugal	.21
45.	Kyrgyzstan	.20
46.	Chile	.18
47.	Macedonia	.17
48.	Botswana	.14
49.	Croatia	.13
50.	Mongolia	.13
51.	Azerbaijan	.12
52.	Kuwait	.10
53.	Ukraine	.10
54.	Saudi Arabia	.09
55.	Byelarus	.09
56.	Armenia	.09
57.	Panama	.09
58.	Trinidad and Tobago	.08
59.	South Africa	.04
60.	Mexico	.00
61.	Uruguay	-.04
62.	Malaysia	-.04
63.	Uzbekistan	-.04
64.	Costa Rica	-.07
65.	Tajikistan	-.09
66.	Philippines	-.11
67.	Thailand	-.15
68.	Zambia	-.16
69.	Russia	-.17
70.	China	-.19
71.	Moldova	-.19
72.	Kazakhstan	-.22
73.	Brazil	-.22
74.	Albania	-.31
75.	Congo	-.32
76.	Iraq	-.32
77.	Turkey	-.32
78.	Venezuela	-.33
79.	Peru	-.34
80.	Laos	-.35
81.	Syria	-.39
82.	Jamaica	-.43
83.	Iran	-.43
84.	Sri Lanka	-.48
85.	Egypt	-.48
86.	India	-.49
87.	Tunisia	-.50
88.	North Korea	-.51
89.	Algeria	-.53
90.	Colombia	-.58
91.	Chad	-.58
92.	Paraguay	-.63
93.	Bhutan	-.64
94.	Indonesia	-.65
95.	Namibia	-.69
96.	Ecuador	-.69
97.	Bolivia	-.77
98.	Madagascar	-.78
99.	Dominican Republic	-.78
100.	El Salvador	-.80
101.	Zimbabwe	-.81
102.	Vietnam	-.83
103.	Guinea	-.91
104.	Uganda	-.92
105.	Cameroon	-.92
106.	Pakistan	-.97
107.	Ivory Coast	-.97
108.	Gabon	-.97
109.	Honduras	-.98
110.	Nicaragua	-1.00
111.	Togo	-1.00
112.	Kenya	-1.02
113.	Cambodia	-1.02
114.	Malawi	-1.04
115.	Ghana	-1.05
116.	Somalia	-1.10
117.	Zaire	-1.12
118.	Guatemala	-1.12
119.	Papua New Guinea	-1.15
120.	Angola	-1.17
121.	Haiti	-1.19
122.	Myanmar (Burma)	-1.19
123.	Burundi	-1.21
124.	Senegal	-1.24
125.	Rwanda	-1.27
126.	Burkina Faso	-1.30
127.	Central African Rep.	-1.31
128.	Sierra Leone	-1.34
129.	Nigeria	-1.38
130.	Gambia	-1.38
131.	Benin	-1.38
132.	Ethiopia	-1.41
133.	Tanzania	-1.44
134.	Bangladesh	-1.46
135.	Liberia	-1.48
136.	Nepal	-1.50
137.	Mauritania	-1.51
138.	Sudan	-1.58
139.	Mozambique	-1.78
140.	Guinea-Bissau	-1.86
141.	Mali	-1.86
142.	Niger	-1.86

Indicator: Capacity for Debate

1.	Botswana	1.49
2.	Iceland	1.38
3.	Panama	1.31
4.	Guinea-Bissau	1.02
5.	Jamaica	1.00
6.	Costa Rica	0.97
7.	Australia	0.96
8.	Uruguay	0.95
9.	Estonia	0.81
10.	Namibia	0.81
11.	Bolivia	0.77
12.	Denmark	0.74
13.	New Zealand	0.74
14.	Switzerland	0.66
15.	Mongolia	0.62
16.	Norway	0.59
17.	Ireland	0.58
18.	Lebanon	0.55
19.	Dominican Republic	0.53
20.	Netherlands	0.53
21.	Sweden	0.47
22.	Israel	0.44
23.	Papua New Guinea	0.42
24.	Jordan	0.41
25.	Austria	0.40
26.	Trinidad and Tobago	0.40
27.	El Salvador	0.39
28.	Malawi	0.39
29.	Spain	0.39
30.	Ecuador	0.38
31.	Canada	0.37
32.	Macedonia	0.37
33.	Belgium	0.36
34.	Finland	0.36
35.	Honduras	0.36
36.	South Africa	0.35
37.	Slovenia	0.34
38.	Benin	0.31
39.	Latvia	0.31
40.	Lithuania	0.31
41.	Sri Lanka	0.31
42.	Czech Republic	0.30
43.	Paraguay	0.30
44.	United Kingdom	0.28
45.	Madagascar	0.26
46.	Greece	0.25
47.	Mali	0.23
48.	Italy	0.22
49.	Nepal	0.22
50.	Slovakia	0.22
51.	United States	0.22
52.	Nicaragua	0.18
53.	Central African Rep.	0.17
54.	Sierra Leone	0.17
55.	Niger	0.16
56.	Argentina	0.15
57.	France	0.15
58.	Portugal	0.15
59.	Zambia	0.15
60.	Peru	0.13
61.	Bosnia and Herz.	0.12
62.	Mozambique	0.12
63.	Germany	0.11
64.	Japan	0.10
65.	Moldova	0.10
66.	Nigeria	0.10
67.	Poland	0.06
68.	Hungary	0.04
69.	Kuwait	0.04
70.	Burkina Faso	0.03
71.	Bulgaria	0.02
72.	Bangladesh	-0.01
73.	Chile	-0.02
74.	India	-0.02
75.	Kyrgyzstan	-0.03
76.	Armenia	-0.04
77.	Romania	-0.04
78.	Guatemala	-0.05
79.	Zimbabwe	-0.09
80.	Ghana	-0.12
81.	South Korea	-0.12
82.	Angola	-0.13
83.	Thailand	-0.13
84.	Venezuela	-0.13
85.	Liberia	-0.15
86.	Mauritania	-0.19
87.	Haiti	-0.20
88.	Philippines	-0.20
89.	Senegal	-0.20
90.	Brazil	-0.21
91.	Ethiopia	-0.21
92.	United Arab Emirates	-0.21
93.	Indonesia	-0.23
94.	Croatia	-0.24
95.	Cambodia	-0.25
96.	Colombia	-0.25
97.	Tajikistan	-0.25
98.	Ukraine	-0.26
99.	Albania	-0.27
100.	Congo	-0.27
101.	Mexico	-0.27
102.	Gabon	-0.29
103.	Tanzania	-0.29
104.	Togo	-0.30
105.	Chad	-0.34
106.	Turkey	-0.34
107.	Burundi	-0.35
108.	Guinea	-0.35
109.	Oman	-0.38
110.	Tunisia	-0.38
111.	Uganda	-0.38
112.	Azerbaijan	-0.47
113.	Kazakhstan	-0.48
114.	Kenya	-0.51
115.	Gambia	-0.52
116.	Russia	-0.53
117.	Ivory Coast	-0.54
118.	Malaysia	-0.54
119.	Morocco	-0.55
120.	Somalia	-0.55
121.	Algeria	-0.57
122.	Bhutan	-0.58
123.	Libya	-0.59
124.	Iran	-0.60
125.	Rwanda	-0.60
126.	Zaire	-0.61
127.	Laos	-0.62
128.	Turkmenistan	-0.63
129.	Cameroon	-0.65
130.	North Korea	-0.67
131.	Vietnam	-0.69
132.	Byelarus	-0.70
133.	Uzbekistan	-0.72
134.	Saudi Arabia	-0.74
135.	Pakistan	-0.81
136.	Iraq	-0.85
137.	Myanmar (Burma)	-0.88
138.	Egypt	-0.91
139.	Syria	-0.94
140.	Sudan	-1.04
141.	Cuba	-1.07
142.	China	-1.20

Indicator: Environmental Governance

1.	United Kingdom	1.47
2.	Switzerland	1.39
3.	Germany	1.21
4.	Netherlands	1.17
5.	United States	1.17
6.	Austria	1.17
7.	Sweden	1.13
8.	New Zealand	1.05
9.	France	1.04
10.	Denmark	1.03
11.	Chile	1.01
12.	Canada	.97
13.	Finland	.92
14.	Japan	.89
15.	Zambia	.83
16.	Iceland	.80
17.	Costa Rica	.74
18.	Israel	.72
19.	Norway	.68
20.	Belgium	.67
21.	Hungary	.65
22.	Uruguay	.61
23.	Croatia	.56
24.	Bolivia	.56
25.	Ireland	.56
26.	Italy	.56
27.	Namibia	.50
28.	Rwanda	.50
29.	Lithuania	.45
30.	Poland	.43
31.	Spain	.42
32.	Uganda	.42
33.	South Africa	.42
34.	Zimbabwe	.39
35.	Czech Republic	.36
36.	Bhutan	.35
37.	Central African Rep.	.34
38.	Latvia	.28
39.	Panama	.27
40.	Cambodia	.24
41.	Argentina	.24
42.	Portugal	.23
43.	Slovakia	.23
44.	Australia	.23
45.	Burundi	.21
46.	Estonia	.21
47.	South Korea	.20
48.	Brazil	.17
49.	Botswana	.16
50.	Slovenia	.14
51.	Tanzania	.12
52.	Saudi Arabia	.05
53.	Guatemala	.03
54.	Senegal	.02
55.	Nepal	.01
56.	Sri Lanka	-.03
57.	Malaysia	-.05
58.	Ivory Coast	-.07
59.	Gambia	-.08
60.	Jamaica	-.09
61.	Burkina Faso	-.09
62.	Ethiopia	-.12
63.	Sierra Leone	-.13
64.	Morocco	-.14
65.	Malawi	-.15
66.	Zaire	-.16
67.	Macedonia	-.16
68.	North Korea	-.19
69.	Guinea	-.19
70.	Mexico	-.20
71.	Chad	-.20
72.	Thailand	-.21
73.	Greece	-.22
74.	India	-.22
75.	Pakistan	-.22
76.	Turkey	-.23
77.	Cuba	-.23
78.	Indonesia	-.26
79.	Oman	-.28
80.	Colombia	-.29
81.	Egypt	-.29
82.	Peru	-.31
83.	Madagascar	-.32
84.	Laos	-.33
85.	Jordan	-.33
86.	Mali	-.33
87.	Mongolia	-.34
88.	Bulgaria	-.35
89.	Togo	-.36
90.	Honduras	-.37
91.	Benin	-.39
92.	Kenya	-.40
93.	Trinidad and Tobago	-.42
94.	Russia	-.42
95.	Dominican Republic	-.42
96.	Venezuela	-.42
97.	Bosnia and Herze.	-.42
98.	Armenia	-.46
99.	Mauritania	-.47
100.	China	-.48
101.	Nicaragua	-.48
102.	Congo	-.51
103.	Haiti	-.52
104.	El Salvador	-.52
105.	Tunisia	-.53
106.	Mozambique	-.53
107.	Papua New Guinea	-.54
108.	Niger	-.55
109.	Azerbaijan	-.56
110.	Lebanon	-.59
111.	Albania	-.61
112.	Vietnam	-.61
113.	Guinea-Bissau	-.62
114.	Moldova	-.64
115.	Kuwait	-.65
116.	Byelarus	-.66
117.	Cameroon	-.66
118.	Myanmar (Burma)	-.67
119.	Philippines	-.68
120.	Kyrgyzstan	-.69
121.	Gabon	-.69
122.	Somalia	-.71
123.	Liberia	-.72
124.	Bangladesh	-.76
125.	United Arab Emirates	-.80
126.	Paraguay	-.80
127.	Tajikistan	-.81
128.	Ghana	-.81
129.	Uzbekistan	-.81
130.	Syria	-.81
131.	Angola	-.82
132.	Kazakhstan	-.83
133.	Romania	-.84
134.	Sudan	-.88
135.	Ecuador	-.90
136.	Algeria	-.93
137.	Ukraine	-1.00
138.	Iran	-1.02
139.	Libya	-1.03
140.	Nigeria	-1.15
141.	Turkmenistan	-1.20
142.	Iraq	-1.31

Indicator: Private Sector Responsiveness

1.	Finland	2.87
2.	Switzerland	2.64
3.	Croatia	2.33
4.	Sweden	1.87
5.	Norway	1.83
6.	Netherlands	1.82
7.	Costa Rica	1.69
8.	Denmark	1.52
9.	United Kingdom	1.09
10.	Slovenia	1.09
11.	Japan	.97
12.	Germany	.89
13.	Canada	.65
14.	Hungary	.58
15.	Spain	.47
16.	New Zealand	.43
17.	Australia	.35
18.	Ireland	.33
19.	France	.33
20.	Belgium	.22
21.	Malaysia	.20
22.	Austria	.19
23.	Iceland	.19
24.	United States	.19
25.	Estonia	.19
26.	Slovakia	.17
27.	Portugal	.17
28.	Jordan	.14
29.	United Arab Emirates	.09
30.	Uruguay	.09
31.	South Korea	.03
32.	Algeria	.02
33.	Thailand	-.01
34.	South Africa	-.02
35.	Poland	-.06
36.	Jamaica	-.07
37.	Egypt	-.12
38.	Czech Republic	-.13
39.	Brazil	-.13
40.	Nigeria	-.16
41.	Panama	-.16
42.	China	-.18
43.	Namibia	-.20
44.	Zimbabwe	-.21
45.	Trinidad and Tobago	-.25
46.	Lebanon	-.27
47.	Zambia	-.27
48.	Lithuania	-.31
49.	Italy	-.33
50.	Chile	-.33
51.	Oman	-.35
52.	Latvia	-.35
53.	Macedonia	-.35
54.	Colombia	-.37
55.	Kenya	-.38
56.	Syria	-.38
57.	Tunisia	-.38
58.	Dominican Republic	-.38
59.	Israel	-.38
60.	Morocco	-.38
61.	Iran	-.39
62.	Ghana	-.40
63.	Saudi Arabia	-.40
64.	Myanmar (Burma)	-.40
65.	Pakistan	-.40
66.	Mexico	-.41
67.	Rwanda	-.41
68.	Uganda	-.41
69.	Bhutan	-.41
70.	Central African Rep.	-.41
71.	Cambodia	-.41
72.	Burundi	-.41
73.	Botswana	-.41
74.	Tanzania	-.41
75.	Senegal	-.41
76.	Nepal	-.41
77.	Ivory Coast	-.41
78.	Gambia	-.41
79.	Burkina Faso	-.41
80.	Ethiopia	-.41
81.	Sierra Leone	-.41
82.	Malawi	-.41
83.	Zaire	-.41
84.	North Korea	-.41
85.	Guinea	-.41
86.	Chad	-.41
87.	Cuba	-.41
88.	Madagascar	-.41
89.	Laos	-.41
90.	Mali	-.41
91.	Mongolia	-.41
92.	Togo	-.41
93.	Benin	-.41
94.	Bosnia and Herze.	-.41
95.	Armenia	-.41
96.	Mauritania	-.41
97.	Congo	-.41
98.	Haiti	-.41
99.	Mozambique	-.41
100.	Papua New Guinea	-.41
101.	Niger	-.41
102.	Azerbaijan	-.41
103.	Albania	-.41
104.	Guinea-Bissau	-.41
105.	Moldova	-.41
106.	Kuwait	-.41
107.	Byelarus	-.41
108.	Cameroon	-.41
109.	Kyrgyzstan	-.41
110.	Gabon	-.41
111.	Somalia	-.41
112.	Liberia	-.41
113.	Tajikistan	-.41
114.	Uzbekistan	-.41
115.	Angola	-.41
116.	Kazakhstan	-.41
117.	Sudan	-.41
118.	Libya	-.41
119.	Turkmenistan	-.41
120.	Iraq	-.41
121.	Greece	-.42
122.	Honduras	-.44
123.	Indonesia	-.45
124.	India	-.47
125.	Argentina	-.49
126.	Nicaragua	-.50
127.	Vietnam	-.50
128.	Philippines	-.50
129.	Ecuador	-.51
130.	Turkey	-.52
131.	Bulgaria	-.56
132.	Peru	-.56
133.	Bangladesh	-.57
134.	Guatemala	-.63
135.	Sri Lanka	-.63
136.	Ukraine	-.74
137.	Russia	-.75
138.	Bolivia	-.78
139.	Paraguay	-.81
140.	El Salvador	-.81
141.	Venezuela	-.82
142.	Romania	-.90

Indicator: Eco-efficiency

1.	Laos	2.62
2.	Paraguay	2.36
3.	Bhutan	2.35
4.	Mozambique	2.21
5.	Uganda	1.35
6.	Albania	1.25
7.	Zambia	1.20
8.	Costa Rica	1.08
9.	Malawi	1.02
10.	Zaire	.99
11.	Ghana	.91
12.	Cameroon	.89
13.	Tanzania	.85
14.	Ethiopia	.85
15.	Uruguay	.74
16.	Mali	.70
17.	Norway	.70
18.	Nepal	.64
19.	Brazil	.63
20.	Sri Lanka	.63
21.	Madagascar	.61
22.	Burundi	.60
23.	Iceland	.60
24.	Guinea	.59
25.	Switzerland	.59
26.	Peru	.57
27.	Colombia	.56
28.	Central African Rep.	.56
29.	El Salvador	.54
30.	Philippines	.50
31.	Austria	.48
32.	Kenya	.47
33.	Haiti	.47
34.	Vietnam	.47
35.	Guatemala	.39
36.	Rwanda	.38
37.	Cambodia	.38
38.	Papua New Guinea	.37
39.	Honduras	.37
40.	Burkina Faso	.35
41.	Benin	.34
42.	New Zealand	.31
43.	Angola	.30
44.	Kyrgyzstan	.26
45.	Sweden	.25
46.	Sudan	.25
47.	Chad	.20
48.	Nicaragua	.18
49.	Myanmar (Burma)	.17
50.	Gambia	.16
51.	Bangladesh	.14
52.	Niger	.12
53.	Bolivia	.11
54.	Namibia	.11
55.	Chile	.10
56.	Dominican Republic	.08
57.	Cuba	.08
58.	Panama	.07
59.	Gabon	.07
60.	Togo	.06
61.	Morocco	.05
62.	Argentina	.04
63.	India	.04
64.	Pakistan	.04
65.	Ecuador	.03
66.	Turkey	.03
67.	Somalia	.03
68.	Congo	.02
69.	Portugal	.01
70.	Zimbabwe	.01
71.	Italy	-.01
72.	Slovenia	-.02
73.	Senegal	-.03
74.	Latvia	-.03
75.	Indonesia	-.03
76.	Botswana	-.04
77.	China	-.07
78.	Liberia	-.07
79.	Denmark	-.07
80.	Ivory Coast	-.08
81.	Tunisia	-.09
82.	Ireland	-.10
83.	Japan	-.10
84.	France	-.10
85.	Guinea-Bissau	-.10
86.	Armenia	-.11
87.	Mexico	-.11
88.	Nigeria	-.11
89.	Finland	-.11
90.	Spain	-.13
91.	Thailand	-.13
92.	Sierra Leone	-.14
93.	Germany	-.18
94.	Canada	-.18
95.	Greece	-.20
96.	Israel	-.22
97.	Egypt	-.22
98.	Bosnia and Herze.	-.23
99.	United Kingdom	-.23
100.	Croatia	-.24
101.	Malaysia	-.31
102.	Romania	-.32
103.	Algeria	-.34
104.	Estonia	-.34
105.	Australia	-.35
106.	Hungary	-.38
107.	United States	-.40
108.	Netherlands	-.41
109.	South Korea	-.42
110.	Belgium	-.43
111.	Slovakia	-.46
112.	Macedonia	-.50
113.	Czech Republic	-.50
114.	Lebanon	-.52
115.	Mauritania	-.53
116.	Poland	-.53
117.	Jordan	-.54
118.	South Africa	-.54
119.	Libya	-.59
120.	Lithuania	-.61
121.	Syria	-.62
122.	Iran	-.64
123.	Oman	-.69
124.	Venezuela	-.76
125.	Kuwait	-.81
126.	Jamaica	-.84
127.	Moldova	-.84
128.	Byelarus	-.85
129.	Tajikistan	-.86
130.	Mongolia	-.94
131.	Kazakhstan	-1.02
132.	Bulgaria	-1.04
133.	Turkmenistan	-1.04
134.	North Korea	-1.12
135.	Saudi Arabia	-1.13
136.	Iraq	-1.16
137.	Russia	-1.23
138.	United Arab Emirates	-1.35
139.	Azerbaijan	-1.61
140.	Uzbekistan	-2.05
141.	Ukraine	-2.16
142.	Trinidad and Tobago	-2.21

Indicator: Participation in International Cooperative Efforts

1.	Congo	1.40
2.	Germany	1.27
3.	Netherlands	1.17
4.	Sweden	1.15
5.	Finland	1.12
6.	United Kingdom	1.07
7.	Denmark	1.04
8.	France	1.02
9.	Austria	1.00
10.	Norway	1.00
11.	Spain	.98
12.	Belgium	.92
13.	Canada	.88
14.	Australia	.86
15.	Japan	.85
16.	Malawi	.81
17.	Macedonia	.79
18.	United States	.78
19.	Bulgaria	.73
20.	Slovakia	.73
21.	New Zealand	.73
22.	Mongolia	.68
23.	Italy	.67
24.	Hungary	.66
25.	Estonia	.62
26.	Switzerland	.60
27.	Czech Republic	.57
28.	Poland	.53
29.	Benin	.52
30.	Jordan	.52
31.	Senegal	.52
32.	Greece	.49
33.	Iceland	.45
34.	Tunisia	.43
35.	Morocco	.37
36.	South Korea	.33
37.	Ghana	.31
38.	Malaysia	.29
39.	Panama	.25
40.	Portugal	.24
41.	Costa Rica	.24
42.	Zambia	.22
43.	Ireland	.22
44.	Lebanon	.22
45.	Bolivia	.21
46.	Uganda	.20
47.	Cuba	.19
48.	Uruguay	.15
49.	Egypt	.14
50.	Mali	.13
51.	Chile	.13
52.	Burkina Faso	.11
53.	Mexico	.10
54.	Argentina	.10
55.	Latvia	.09
56.	Ecuador	.09
57.	Indonesia	.09
58.	Algeria	.09
59.	Sri Lanka	.08
60.	Romania	.08
61.	Thailand	.07
62.	Zaire	.06
63.	Vietnam	.06
64.	Ivory Coast	.03
65.	Niger	.03
66.	Russia	.00
67.	Nicaragua	.00
68.	Papua New Guinea	-.01
69.	India	-.02
70.	Kenya	-.02
71.	Philippines	-.03
72.	Botswana	-.04
73.	Zimbabwe	-.07
74.	Iran	-.07
75.	Peru	-.08
76.	Israel	-.10
77.	Cameroon	-.10
78.	Gabon	-.11
79.	China	-.12
80.	Brazil	-.13
81.	South Africa	-.13
82.	Uzbekistan	-.13
83.	Jamaica	-.14
84.	Bhutan	-.14
85.	Colombia	-.14
86.	Chad	-.14
87.	Pakistan	-.16
88.	Burundi	-.19
89.	Syria	-.21
90.	Tanzania	-.23
91.	Togo	-.23
92.	Paraguay	-.23
93.	Trinidad and Tobago	-.23
94.	El Salvador	-.25
95.	Venezuela	-.26
96.	Madagascar	-.30
97.	Mozambique	-.31
98.	Ethiopia	-.32
99.	Azerbaijan	-.33
100.	Sierra Leone	-.39
101.	Slovenia	-.39
102.	Bangladesh	-.45
103.	Namibia	-.47
104.	Lithuania	-.51
105.	Croatia	-.51
106.	Turkey	-.52
107.	Oman	-.52
108.	Laos	-.52
109.	Central African Rep.	-.53
110.	Nepal	-.53
111.	Nigeria	-.54
112.	Haiti	-.55
113.	Dominican Republic	-.55
114.	Kazakhstan	-.59
115.	Sudan	-.60
116.	Gambia	-.60
117.	Byelarus	-.60
118.	Turkmenistan	-.61
119.	Kuwait	-.64
120.	Honduras	-.65
121.	Guatemala	-.66
122.	United Arab Emirates	-.67
123.	Saudi Arabia	-.69
124.	Guinea-Bissau	-.73
125.	Liberia	-.74
126.	Mauritania	-.75
127.	Libya	-.77
128.	North Korea	-.77
129.	Ukraine	-.78
130.	Myanmar (Burma)	-.82
131.	Moldova	-.82
132.	Somalia	-.84
133.	Armenia	-.85
134.	Guinea	-.87
135.	Albania	-.88
136.	Tajikistan	-.94
137.	Angola	-1.03
138.	Cambodia	-1.03
139.	Rwanda	-1.05
140.	Bosnia and Herze.	-1.12
141.	Kyrgyzstan	-1.18
142.	Iraq	-1.31

Indicator: Reducing Greenhouse Gas Emissions

1.	Chad	.97
2.	Namibia	.97
3.	Somalia	.97
4.	Cambodia	.95
5.	Ethiopia	.95
6.	Laos	.95
7.	Burundi	.94
8.	Uganda	.94
9.	Mali	.94
10.	Zaire	.94
11.	Central African Rep.	.93
12.	Rwanda	.92
13.	Cameroon	.91
14.	Sudan	.90
15.	Mozambique	.90
16.	Burkina Faso	.89
17.	Guinea	.89
18.	Madagascar	.89
19.	Nepal	.88
20.	Haiti	.87
21.	Malawi	.87
22.	Gambia	.86
23.	Benin	.86
24.	Bangladesh	.85
25.	Tanzania	.85
26.	Niger	.85
27.	Ghana	.85
28.	Togo	.84
29.	Myanmar (Burma)	.83
30.	Sri Lanka	.82
31.	Albania	.79
32.	Sierra Leone	.77
33.	Zambia	.77
34.	Angola	.75
35.	Papua New Guinea	.73
36.	Paraguay	.71
37.	Senegal	.70
38.	Costa Rica	.67
39.	Guinea-Bissau	.67
40.	Guatemala	.66
41.	El Salvador	.65
42.	Kenya	.65
43.	Peru	.63
44.	Liberia	.62
45.	Vietnam	.62
46.	Uruguay	.61
47.	Philippines	.61
48.	Nicaragua	.59
49.	Bhutan	.58
50.	Honduras	.57
51.	Brazil	.55
52.	Colombia	.54
53.	Morocco	.54
54.	Pakistan	.51
55.	Armenia	.49
56.	Indonesia	.47
57.	Zimbabwe	.45
58.	Panama	.40
59.	India	.37
60.	Ivory Coast	.36
61.	Gabon	.36
62.	Botswana	.36
63.	Tunisia	.31
64.	Kyrgyzstan	.30
65.	Egypt	.29
66.	Argentina	.28
67.	Dominican Republic	.25
68.	Bolivia	.19
69.	Cuba	.18
70.	Turkey	.17
71.	Switzerland	.15
72.	Mauritania	.14
73.	Sweden	.14
74.	Nigeria	.14
75.	Latvia	.11
76.	Bosnia and Herze.	.11
77.	Thailand	.10
78.	Chile	.09
79.	Ecuador	.08
80.	Mexico	.08
81.	Tajikistan	.05
82.	Portugal	.03
83.	France	.02
84.	Congo	.01
85.	China	-.02
86.	Jordan	-.04
87.	Spain	-.05
88.	Lithuania	-.08
89.	Croatia	-.11
90.	Norway	-.11
91.	Iceland	-.12
92.	Romania	-.12
93.	Italy	-.13
94.	Algeria	-.14
95.	Hungary	-.18
96.	Austria	-.20
97.	Slovenia	-.30
98.	New Zealand	-.31
99.	Moldova	-.32
100.	Malaysia	-.33
101.	Iran	-.35
102.	Syria	-.35
103.	Japan	-.36
104.	South Korea	-.43
105.	Greece	-.44
106.	United Kingdom	-.45
107.	Lebanon	-.47
108.	Slovakia	-.48
109.	Belgium	-.51
110.	Denmark	-.52
111.	Germany	-.55
112.	Byelarus	-.57
113.	Ireland	-.60
114.	Netherlands	-.61
115.	Iraq	-.61
116.	Finland	-.61
117.	Israel	-.67
118.	Jamaica	-.69
119.	Libya	-.78
120.	Bulgaria	-.79
121.	Oman	-.80
122.	Venezuela	-.86
123.	South Africa	-.91
124.	Poland	-.97
125.	Macedonia	-1.07
126.	Czech Republic	-1.17
127.	Canada	-1.31
128.	Mongolia	-1.35
129.	Russia	-1.50
130.	Kazakhstan	-1.60
131.	Uzbekistan	-1.63
132.	Azerbaijan	-1.67
133.	United States	-1.73
134.	Australia	-1.74
135.	Estonia	-1.75
136.	Turkmenistan	-1.81
137.	North Korea	-1.82
138.	Ukraine	-1.88
139.	Saudi Arabia	-1.89
140.	Kuwait	-2.15
141.	United Arab Emirates	-2.90
142.	Trinidad and Tobago	-3.05

Indicator: Reducing Transboundary Environmental Pressures

1. Bhutan	1.21
2. Slovenia	1.13
3. Armenia	1.08
4. Central African Rep.	1.06
5. Slovakia	1.03
6. Nepal	.93
7. Mongolia	.87
8. Uganda	.80
9. Israel	.78
10. Albania	.78
11. Laos	.78
12. Moldova	.78
13. Cambodia	.71
14. Hungary	.67
15. Kyrgyzstan	.66
16. Ethiopia	.65
17. Mozambique	.57
18. Macedonia	.57
19. Turkmenistan	.56
20. Tajikistan	.56
21. Bolivia	.55
22. Somalia	.52
23. Croatia	.50
24. Latvia	.49
25. Austria	.49
26. Chad	.48
27. Honduras	.47
28. Sudan	.47
29. Sierra Leone	.46
30. Zaire	.46
31. Benin	.46
32. Guatemala	.44
33. Mauritania	.43
34. Byelarus	.43
35. Burkina Faso	.43
36. Liberia	.42
37. Paraguay	.42
38. Angola	.42
39. Madagascar	.41
40. Uzbekistan	.41
41. Kazakhstan	.41
42. Tanzania	.40
43. Burundi	.40
44. Guinea	.40
45. Myanmar (Burma)	.37
46. Switzerland	.37
47. Niger	.37
48. New Zealand	.35
49. Guinea-Bissau	.35
50. Rwanda	.35
51. Pakistan	.34
52. Bangladesh	.33
53. Iraq	.32
54. El Salvador	.31
55. Haiti	.30
56. Papua New Guinea	.30
57. Czech Republic	.30
58. Mali	.30
59. Bosnia and Herze.	.29
60. Bulgaria	.29
61. Ireland	.28
62. Netherlands	.25
63. Azerbaijan	.24
64. Colombia	.24
65. Togo	.22
66. Lithuania	.21
67. Costa Rica	.21
68. Ivory Coast	.20
69. Ecuador	.19
70. Botswana	.18
71. Sri Lanka	.15
72. Belgium	.14
73. Nicaragua	.14
74. North Korea	.12
75. Namibia	.12
76. Estonia	.12
77. Dominican Republic	.11
78. Syria	.11
79. Egypt	.10
80. Gambia	.10
81. Vietnam	.08
82. Malawi	.06
83. Uruguay	.05
84. Zambia	.05
85. Oman	.05
86. Sweden	.04
87. Nigeria	.04
88. Australia	.03
89. Algeria	.03
90. Kenya	-.01
91. Cameroon	-.02
92. Jordan	-.03
93. Romania	-.05
94. Congo	-.05
95. Jamaica	-.07
96. Zimbabwe	-.08
97. Trinidad and Tobago	-.08
98. Tunisia	-.09
99. Morocco	-.09
100. Lebanon	-.10
101. Iceland	-.10
102. South Africa	-.11
103. Finland	-.13
104. Cuba	-.14
105. Saudi Arabia	-.15
106. Denmark	-.20
107. Iran	-.23
108. Ghana	-.23
109. Panama	-.25
110. Gabon	-.27
111. Mexico	-.27
112. Libya	-.30
113. Canada	-.37
114. Kuwait	-.39
115. Greece	-.39
116. Venezuela	-.40
117. United Arab Emirates	-.40
118. Argentina	-.41
119. Brazil	-.42
120. Ukraine	-.46
121. Turkey	-.56
122. Philippines	-.63
123. Senegal	-.64
124. France	-.69
125. Norway	-.72
126. Germany	-.75
127. Poland	-.77
128. India	-.78
129. Italy	-.82
130. Indonesia	-.90
131. Malaysia	-.95
132. Thailand	-.96
133. Portugal	-.97
134. South Korea	-1.05
135. United States	-1.15
136. Peru	-1.22
137. Chile	-1.26
138. United Kingdom	-1.35
139. Japan	-1.41
140. Russia	-1.71
141. Spain	-1.89
142. China	-2.56