SEDAC Compendium of Environmental Sustainability Indicator Collections Version 1.1 – Data Dictionary

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This data dictionary provides background information such as data source, dates and methodology for each of the indicators included in the SEDAC Compendium of Environmental Sustainability Indicators. The compendium includes several collections of national-level sustainability indicators, as described in the following table. The compendium includes both "raw" data/variables and aggregated indices. It also includes ancillary data such as dummy variables for land locked and small island countries, population, GDP, and land area.

Indicator Collection	Short Name	Indicator # Range	Source
2006 Environmental Performance Index	EPI 2006	1-39	Esty, D.C., M.A. Levy, T. Srebotnjak, A. de Sherbinin, C.H. Kim, and B. Anderson (2006). *Pilot 2006 Environmental Performance Index*. New Haven: Yale Center for Environmental Law & Policy.
2005 Environmental Sustainability Index	ESI 2005	40-142	Esty, D.C., M. Levy, T. Srebotnjak, and Alexander de Sherbinin (2005). *2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship*. New Haven: Yale Center for Environmental Law & Policy.
2004 Environmental Vulnerability Index	EVI 2004	143-253	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384.
Rio to Johannes-burg Dashboard of Sustainability	Rio to Johannesburg Dashboard	254-288	O'Connor, J., and J. Jesinghaus. 2001. *Rio to Johannesburg Dashboard of Sustainability*, http://esl.jrc.it/envind/dashbrds.htm
The Wellbeing of Nations	Wellbeing of Nations	289-411	Prescott-Allen, R. 2001. *The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment*. Washington, DC: Island Press.
2006 National Footprint Accounts	Ecological Footprint	412-426	Global Footprint Network. 2006. *National Footprint Accounts*, 2006 Edition. http://www.footprintnetwork.org

Table of Contents

Collection 1: 2006 Environmental Performance Index 2
Collection 2: 2005 Environmental Sustainability Index 17
Collection 3: 2004 Environmental Vulnerability Index 69
Collection 4: Rio to Johannesburg Dashboard 150
Collection 5: Wellbeing of Nations 165
Collection 6: 2006 National Footprint Accounts 235
Ancillary Data 240

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Collection 1: 2006 Environmental Performance Index

Indicator	EPI2006	**Collection**	fecolo
Indicator #	1	**Sub-Index**	

Indicator Name Environmental Performance Index (EPI)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Pilot 2006 Environmental Performance Index (EPI) centers on two broad environmental protection objectives: (1) reducing environmental stresses on human health, and (2) promoting ecosystem vitality and sound natural resource management. Derived from a careful review of the environmental literature, these twin goals mirror the priorities expressed by policymakers. Environmental health and ecosystem vitality are gauged using sixteen indicators tracked in six well-established policy categories: Environmental Health, Air Quality, Water Resources, Productive Natural Resources, Biodiversity and Habitat, and Sustainable Energy. The Pilot 2006 EPI utilizes a proximity-to-target methodology focused on a core set of environmental outcomes linked to policy goals for which every government should be held accountable. By identifying specific targets and measuring how close each country comes to them, the EPI provides a factual foundation for policy analysis and a context for evaluating performance. Issue-by-issue and aggregate rankings facilitate cross-country comparisons both globally and within relevant peer groups. The EPI is the result of collaboration among the Yale Center for Environmental Law and Policy (YCELP), Columbia University Center for International Earth Science Information Network (CIESIN), the World Economic Forum, and the Joint Research Centre (JRC) of the European Commission.

The EPI represents an unweighted average of two broad objectives - Environmental Health (which includes the Environmental Health policy category) and Ecosystem Vitality and Natural Resource Management (which includes the following policy categories: Air Quality, Water Resources, Biodiversity and Habitat, Productive Natural Resources, and Sustainable Energy).

Indicator	ENVHEALEPI	**Collection**	EPI 2006
Indicator #	2	**Sub-Index**	

Indicator Name Environmental Health

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Environmental Health policy category represents a weighted average of the following indicators (weights in parentheses):

Urban particulates (.13)
Indoor airpollution (.22)

Drinking water (.22)
Adequate sanitation (.22)
Child mortality (.21)

Indicator BIODIVEPI **Collection** EPI 2006

Indicator # 3 **Sub-Index**

Indicator Name Biodiversity and Habitat

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Biodiversity and Habitat policy category represents a weighted average of the following indicators (weights in parentheses):

Wilderness Protection (.39)
Ecoregion Protection (.39)
Timber Harvest Rate (.15)
Water Consumption (.07)

Indicator ENERGYEPI **Collection** EPI 2006

Indicator # 4 **Sub-Index**

Indicator Name Sustainable Energy

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Sustainable Energy policy category represents a weighted average of the following indicators (weights in parentheses):

Energy Efficiency (.43)
Renewable Energy (.10)
CO2 per GDP (.47)

Indicator WATEREPI **Collection** EPI 2006

Indicator # 5 **Sub-Index**

Indicator Name Water Resources

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Water Resources policy category represents an unweighted average of the following indicators: Nitrogen Loading and Water Consumption.

Indicator AIREPI **Collection** EPI 2006

Indicator # 6 **Sub-Index**

Indicator Name Air Quality

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Air Quality policy category represents an unweighted average of the following indicators: Urban Particulates and Regional Ozone.

Indicator RESMGTEPI **Collection** EPI 2006

Indicator # 7 **Sub-Index**

Indicator Name Productive Resource Management

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2006

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Productive Resource Management policy category represents an unweighted average of the following indicators:

Timber Harvest Rate
Overfishing
Agricultural Subsidies

Indicator MORTALITYRAW **Collection** EPI 2006

Indicator # 8 **Sub-Index**

Indicator Name Child Mortality

Units Deaths per 1000 population aged 1-4

Reference Year 2000-2005

Source United Nations, Department of Economic and Social Affairs, Population Division: World Population Prospects DEMOBASE extract. 2005. Age Specific Mortality Rate by Age (mx) - Medium variant, Revision 2004. Available at: http://esa.un.org/unpp/

Methodology This variable was incorporated from the UN Population Division's DEMOBASE. These data form part of the Population Division's consistent time series estimates and projections of population trends and, as such, are adjusted data derived from empirical data on mortality reported in survey results or vital statistics.

Indicator	MORTALITYEPI	**Collection**	EPI 2006
Indicator #	9	**Sub-Index**	
Indicator Name	Child Mortality (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	2000-2005		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable MORTALITYRAW, data were converted to a proximity to target measure, with 0 deaths per 1,000 children being the target.		

Indicator	INDOORRAW	**Collection**	EPI 2006
Indicator #	10	**Sub-Index**	
Indicator Name	Indoor Air Pollution		
Units	Percentage of households using solid fuels, adjusted for ventilation		
Reference Year	2004		
Source	Smith KR, Mehta S, Maeusezahl-Feuz M, Indoor smoke from household solid fuels, in Ezzati M, Rodgers AD, Lopez AD, Murray CJL (eds) Comparative Quantification of Health Risks: Global and Regional Burden of Disease due to Selected Major Risk Factors, Geneva: World Health Organization, Vol 2 pp. 1435-1493, 2004.		
Methodology	Solid fuel use is defined as the household combustion of coal or biomass (such as dung, charcoal, wood, or crop residues). The approach taken in this guide is based on a binary classification scheme for exposure levels, separating the study population into those exposed to solid fuel use and those not exposed followed by the application of relative risks derived from a comprehensive review of the current epidemiological literature on solid fuel use. Central estimates used. For China, original data provided separately for children and adults. These values were averaged. A single value was provided covering both Ethiopia and Eritrea. This was applied to both countries. We assigned the value of 0 for both Iceland and Malta.		

Indicator	INDOOREPI	**Collection**	EPI 2006
Indicator #	11	**Sub-Index**	
Indicator Name	Indoor Air Pollution (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	2004		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable INDOORRAW, the data were converted to a proximity to target measure, with 0 percent of households using solid fuels without adequate ventilation being the target.		

Indicator	WATSUPRAW	**Collection**	EPI 2006
Indicator #	12	**Sub-Index**	

Indicator Name Drinking Water Access

Units Percentage of population with access to an improved water source

Reference Year 1990 and 2002

Source Millennium Indicator: 'Water, percentage of population with sustainable access to improved drinking water sources, total (WHO-UNICEF).' Data last updated on 10 November 2004. Found at: http://millenniumindicators.un.org/unsd/mi/mi_series_results.asp?rowId=665. Accessed on 23 September 2005. Additional source information: World Health Organization and United Nations Children's Fund. Water Supply and Sanitation Collaborative Council. Global Water Supply and Sanitation Assessment, 2000 Report, Geneva and New York. Updated data available at http://www.childinfo.org

Methodology "Improved" water supply technologies are: household connection, public standpipe, borehole, protected dug well, protected spring, rainwater collection. "Not improved" are: unprotected well, unprotected spring, vendor-provided water, bottled water (based on concerns about the quantity of supplied water, not concerns over the water quality), tanker truck-provided water. It is assumed that if the user has access to an "improved source" then such source would be likely to provide 20 litres per capita per day at a distance no longer than 1000 metres. This hypothesis is being tested through National Health Surveys which are being conducted by WHO in 70 countries. (Communication of 25 March 2003 from the WHO Water, Sanitation and Health Programme). Source: World Health Organization and United Nations Children's Fund. Water Supply and Sanitation Collaborative Council. Global Water Supply and Sanitation Assessment, 2000 Report, Geneva and New York. (pp. 77- 78). Values for 1990 are used for the following countries: Argentina, New Zealand, and Saudi Arabia. The following countries provided data to the 2005 ESI: United Arab Emirates, Belgium, Ireland, Italy, Taiwan. OECD countries with missing data are set to 100: Czech Rep., France, Greece, Poland, Portugal, Spain, and Great Britain. Liechtenstein and Slovenia are also set to 100. The total population of a country may comprise either all usual residents of the country (de jure population) or all persons present in the country (de facto population) at the time of the census. For purposes of international comparisons, the de facto definition is recommended. Source: United Nations. Multilingual Demographic Dictionary, English Section. Department of Economic and Social Affairs, Population Studies, No. 29 (United Nations publication, Sales No. E.58.XIII.4).

Indicator	WATSUPEPI	**Collection**	EPI 2006
Indicator #	13	**Sub-Index**	

Indicator Name Drinking Water Access (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 1990 and 2002

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable WATSUPRAW, the data were then converted to a proximity to target measure, with a coverage of 100% being the target.

Indicator	ACSATRAW	**Collection**	EPI 2006
Indicator #	14	**Sub-Index**	

Indicator Name Adequate Sanitation

Units Percentage of population with improved access

Reference Year 1990 and 2002

Source Millenium Indicator: 'Sanitation, percentage of the population with access to improved sanitation, total (WHO-UNICEF).' Data last updated on 10 November 2004. Found at: http://millenniumindicators.un.org/unsd/mi/mi_series_results.asp?rowID=668. Accessed on 23 September 2005. More source information: World Health Organization and United Nations Children's Fund. Water Supply and Sanitation Collaborative Council. Global Water Supply and Sanitation Assessment, 2000 Report, Geneva and New York. Updated data available at www.childinfo.org

Methodology "Improved" sanitation technologies are: connection to a public sewer, connection to septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine. The excreta disposal system is considered adequate if it is private or shared (but not public) and if hygienically separates human excreta from human contact. "Not improved" are: service or bucket latrines (where excreta are manually removed), public latrines, latrines with an open pit. The total population of a country may comprise either all usual residents of the country (de jure population) or all persons present in the country (de facto population) at the time of the census. For purposes of international comparisons, the de facto definition is recommended. Source: United Nations. Multilingual Demographic Dictionary, English Section. Department of Economic and Social Affairs, Population Studies, No. 29 (United Nations publication, Sales No. E.58.XIII.4). 2002 Values for Argentina and Malaysia are 1990 values. The following OECD countries had missing values that were set to 100: Belgium, Czech Rep., Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, New Zealand, Norway, Poland, Portugal, Korea, Spain, and Great Britain. Liechtenstein and Slovenia were also set to 100 on the basis that their per capita incomes exceeded US$14,000, which is the empirical threshold beyond which all countries have 100% coverage.

Indicator	ACSATEPI	**Collection**	EPI 2006
Indicator #	15	**Sub-Index**	

Indicator Name Adequate Sanitation (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 1990 and 2002

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable ACSATRAW, the data were then converted to a proximity to target measure, with a coverage of 100% being the target.

Indicator	PM10RAW	**Collection**	EPI 2006
Indicator #	16	**Sub-Index**	

Indicator Name Urban Particulates

Units Population weighted average of micrograms per cubic meter

Reference Year PM10 data: 1999, Population data 2000

Source Global Model of Ambient Particulates (GMAPS), World Bank (http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20785646~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html), reference papers: Kiran Dev Pandey, David Wheeler, Bart Ostro, Uwe Deichmann, and Kirk Hamilton, Katie Bolt (forthcoming 2006, available at above link) Ambient Particulate Matter Concentrations in Residential and Pollution Hotspot areas of World Cities: New Estimates based on the Global Model of Ambient Particulates (GMAPS), Aaron J. Cohen, et al. 2004. Chapter 17: Urban air pollution. In: Ezzati et al. (eds). Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Health Risks, Geneva: World Health Organization (http://ehs.sph.berkeley.edu/krsmith/publications/Chapt%2017%20Urban%20outdoor%20air.pdf); More recent data were obtained for Albania (2002, Ministry of Environment), Bulgaria (2002, European Environment Agency), Czech Republic (2002, EEA), Hungary (2002, EEA), Romania (1998, AMIS) and Slovakia (2002, EEA).

Methodology A population weighted PM10 concentration estimate was calculated by country. Population weighting was used to account for exposure. Only cities larger than 100,000 population and national capitals were considered.

Indicator PM10EPI **Collection** EPI 2006

Indicator # 17 **Sub-Index**

Indicator Name Urban Particulates (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year PM10 data: 1999, Population data 2000

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable PM10RAW, the data were then converted to a proximity to target measure, with an ambient concentration of 10 micrograms per cubic meter being the target.

Indicator OZONERAW **Collection** EPI 2006

Indicator # 18 **Sub-Index**

Indicator Name Regional Ozone

Units Ozone concentration (parts per billion)

Reference Year 1990-2004 (10 highest concentrations from this 14 year period)

Source Data on ozone concentrations up to an altitude of 70 meters above ground level from the global chemical tracer model (Mozart-2) were processed by Jungfeng Liu under the overall supervision of Denise Mauzerall, Princeton University. MOZART was developed at NCAR, the Max-Planck-Institute for Meteorology, and NOAA/GFDL. Available at: http://gctm.acd.ucar.edu/mozart/models/m2/index.shtml. There are currently 3 versions of the model. MOZART-2 is the tropospheric version that was published in Horowitz et al. [JGR, 2003]. Paper available at: http://www.gfdl.noaa.gov/~lwh/mozart/moz2_paper.pdf.

Methodology We used the Mozart Model to output daily ozone concentration estimates on a global grid measuring approximately 1.9 degrees, for a 14-year time period. For each grid cell, we calculated the average of the 10 highest daily concentrations. We then calculated two national aggregations. First, we averaged the 10 highest daily concentrations across all grid cells within a country. Second, we calculated the maximum of these maximum highest daily

averages across all grid cells within a country. We then averaged these two national values to arrive at a single composite measure of ozone concentration.

Indicator	OZONEEPI	**Collection**	EPI 2006
Indicator #	19	**Sub-Index**	
Indicator Name	Regional Ozone (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	1990-2004 (10 highest concentrations from this 14 year period)		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable OZONERAW, the data were then converted to a proximity to target measure, with an ambient concentration of 15 parts per billion of ozone being the target.		

Indicator	NLOADRAW	**Collection**	EPI 2006
Indicator #	20	**Sub-Index**	
Indicator Name	Nitrogen Loading		
Units	Average nitrogen concentration in a country's water bodies (milligrams per liter)		
Reference Year	Contemporary (mean annual 1950-1995)		
Source	University of New Hampshire, Water Systems Analysis Group (http://www.watsys.sr.unh.edu). Nitrogen loading was computed based on the methodology described in Green, P. A., C. J. Vörösmarty, M. Meybeck, J. N. Galloway, B. J. Peterson, and E. W. Boyer. 2004. Pre-industrial and contemporary fluxes of nitrogen through rivers: a global assessment based on topology, Biogeochemistry, 68:71-105. It accounts for the following: atmospheric nitrogen deposition; nitrogen fixation; nitrogenous fertilizer loads; livestock nitrogen loading; and human nitrogen loading. Global discharge fields were computed by blending mean annual discharge observations (where available) with a climatology (1950-1995) of discharge output from the Water Balance Model described in Vörösmarty, C. J., C. A. Federer and A. L. Schloss. 1998. Evaporation functions compared on US watershed: Possible implications for global-scale water balance and terrestrial ecosystem modeling, Journal of Hydrology, 207 (3-4): 147-169. It includes the following: gridded precipitation fields (annual precipitation per grid cell); gridded temperature fields (annual temperature per grid cell); gridded runoff fields (annual runoff per grid cell).		
Methodology	This variable represents nitrogen loading per average flow of a nation's river basin. Though we titled the variable Nitrogen Loading, the data actually reflect potential concentrations in kg/m3 (converted to mg/L). They are potential concentrations because they do not take into account for the self-cleansing potential of land and aquatic ecosystems, which may remove up to 80% of incident loads. Total basin outflow for each river basin was redistributed as runoff equally across all 1/4 degree grid cells within each basin. Nitrogen loading and redistributed runoff were summed within the partial river basins that fell within each country. Summed nitrogen loading within each partial basin was divided by the summed runoff within the same partial basin resulting in a nitrogen concentration (NLOAD, in kg/m3) per partial basin. The average nitrogen loading in a country's rivers is an areally-weighted average of the NLOAD values for all partial basins within each country. Kg/m3 values were then converted to mg/liter to render an average concentration. Values above 660,000 mg/L were adjusted to the		

maximum of 660,000, which reflects the concentration at which nitrogen is no longer soluble and any additional nitrogen will remain in its solid form.

Indicator	NLOADEPI	**Collection**	EPI 2006
Indicator #	21	**Sub-Index**	
Indicator Name	Nitrogen Loading (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	Contemporary (mean annual 1950-1995)		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable NLOADRAW, the data were then converted to a proximity to target measure, with a concentration of 1 mg/L of dissolved nitrogen being the target.		

Indicator	OVRSUBRAW	**Collection**	EPI 2006
Indicator #	22	**Sub-Index**	
Indicator Name	Water Consumption		
Units	Percentage of territory in which consumption exceeds 40% of available water		
Reference Year	Contemporary (mean annual 1950-1995)		
Source	University of New Hampshire, Water Systems Analysis Group (http://www.watsys.sr.unh.edu). Human water demand was computed using the following data sources:population per grid cell; per capita country or sub national level domestic water demand; per capita country or sub national level industrial water demand; irrigated land extent per grid cell (according to Döll, P., Siebert, S. 2000. A digital global map of irrigated areas. ICID Journal, 49(2), 55-66); and country or sub national level agricultural water demand (irrigation). Global discharge fields were computed by blending mean annual discharge observations (where available) with a climatology (1950-1995) of discharge output from the Water Balance Model based on Vörösmarty, C. J., C. A. Federer and A. L. Schloss. 1998. Evaporation functions compared on US watershed: Possible implications for global-scale water balance and terrestrial ecosystem modeling, Journal of Hydrology, 207 (3-4): 147-169.		
Methodology	An indicator of relative water demand (RWD) for each 1/4 degree grid cell was computed by dividing total human water demand (domestic + industrial + agricultural water or DIA) by renewable water supply (Q). RWD = 0.4 was established as the threshold for water stressed conditions. The percentage of territory in which water resources are oversubscribed was computed by summing the area of grid cells in each country where RWD >= 0.4. Details on the computation and use of RWD (alternatively known as the Relative Water Stress Index or RWSI) can be found in Vörösmarty, C. J., P. Green, J. Salisbury and R. B. Lammers. 2000. Global water resources: vulnerabilty from climate change and population growth, Science, 289:284-288 and Vörösmarty, C. J., E. M. Douglas, P. Green and C. Revenga. 2005. Geospatial Indicators of Emerging Water Stress: An Application to Africa, Ambio, 34 (3): 230-236."		

Indicator	OVRSUBEPI	**Collection**	EPI 2006
Indicator #	23	**Sub-Index**	
Indicator Name	Water Consumption (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	Contemporary (mean annual 1950-1995)		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable OVERSUBRAW, the data were converted to a proximity to target measure, with 0% of the country's territory subject to oversubscription being the target.		

Indicator	PWIRAW	**Collection**	EPI 2006
Indicator #	24	**Sub-Index**	
Indicator Name	Wilderness Protection		
Units	Percentage of wild areas that are protected		
Reference Year	circa 2000		
Source	Protected areas data: 2005 World Database on Protected Areas (http://maps.geog.umd.edu/WDPA/WDPA_info/English/WDPA2005.html); Wilderness areas data: The Human Footprint, v.2, 2005, CIESIN, Wildlife Conservation Society (http://www.ciesin.columbia.edu/wild_areas/)		
Methodology	For each biome in a country, the following were calculated: the mean and standard deviation of Human Influence Index values, the sum of the footprint of human habitation (settlements, land use), infrastructural development (transportation and electric grid) and the population densit. The wildest parts of that biome were identified as those areas whose Human Influence Index values were less than one standard deviation below the mean. This resulted in a grid for each country that included the wildest areas by biome. Protected areas were then overlaid on the wildest areas in the country to determine the percentage of wild areas that are protected. Protected areas in the World Database on Protected Areas (WDPA) that did not include boundaries were attributed boundaries by drawing a circle around the protected area's centroid equal to the area of the protected area. Cultural heritage and urban protected areas were not removed from the protected areas layer.		

Indicator	PWIEPI	**Collection**	EPI 2006
Indicator #	25	**Sub-Index**	
Indicator Name	Wilderness Protection (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	circa 2000		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable PWIRAW, the data were then converted to a proximity to target measure, with 90 percent coverage of wild areas being the target.		

Indicator	PACOVRAW	**Collection**	EPI 2006
Indicator #	26	**Sub-Index**	
Indicator Name	Ecoregion Protection		
Units	Score of 0 to 1 (proportion of the target of 10% reached)		
Reference Year	2004		
Source	Protected Areas data: 2005 World Database of Protected Areas(http://maps.geog.umd.edu/WDPA/WDPA_info/English/WDPA2005.html); Ecoregions data: World Wildlife Federations map: Terrestrial Ecoregions of the World (http://worldwildlife.org/wildworld/).		
Methodology	The global target for protected areas coverage is 10% of national territory. Thus, the target is for every country to have 10% of the land area in each of its biomes under protected status. For each biome in each country we calculate 10% of its total area, and then calculate the actual land area under protected status for that biome. We then take the ratio of the land under protected status to the target of 10% of the biome's area. If the area protected is equal to or greater than 10% of the biome, then the country receives a score of 1 for that biome. If only 5% is protected, the country receives a score of 0.5. The ratios for each biome are then averaged using a simple arithmetic average.		

Indicator	PACOVEPI	**Collection**	EPI 2006
Indicator #	27	**Sub-Index**	
Indicator Name	Ecoregion Protection (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	2004		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable PACOVRAW, the data were converted to a proximity to target measure, with a score of 1 being (protected areas covering at least 10% of all ecoregions) being the target.		

Indicator	HARVESTRAW	**Collection**	EPI 2006
Indicator #	28	**Sub-Index**	
Indicator Name	Timber Harvest Rate		
Units	Percentage of standing forests harvested		
Reference Year	2000 and 2004		
Source	Data on volume of standing forests was taken from the FAO publication State of the World's Forests 2005, accessed at: http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/007/y5574e/y5574e00.htm (accessed 6 December 2005). Data on timber harvest was taken from the FAO forestry database FAOSTAT, available at: http://faostat.fao.org/faostat/collections?version=ext&hasbulk=0&subset=forestry (accessed 7 December 2005).		

Methodology Timber harvest is represented by FAO data on Roundwood. This term is defined by the FAO's Joint Forest Sector Questionnaire Definitions as follows: All roundwood felled or otherwise harvested and removed. It comprises all wood obtained from removals, i.e. the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses during the period, calendar year or forest year. It includes all wood removed with or without bark, including wood removed in its round form, or split, roughly squared or in other form e.g. branches, roots, stumps and burls (where these are harvested) and wood that is roughly shaped or pointed. It is an aggregate comprising wood fuel, including wood for charcoal and industrial roundwood (wood in the rough). It is reported in cubic metres solid volume underbarck (i.e. including bark). Standing forest is represented by total wood volume in forests measured in millions of cubic meters.

Indicator HARVESTEPI **Collection** EPI 2006

Indicator # 29 **Sub-Index**

Indicator Name Timber Harvest Rate (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2000 and 2004

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable HARVESTRAW, the data were converted to a proximity to target measure, with a timber harvest rate of 3% of standing volume being the target.

Indicator AGSUBRAW **Collection** EPI 2006

Indicator # 30 **Sub-Index**

Indicator Name Agricultural Subsidies

Units Agricultural subsidies adjusted for environmental payments as percent of agricultural value added

Reference Year Average of available annual data for the period 1995-2001

Source The data on agricultural subsidies for this indicator are drawn from two sources. For countries other than the 15 original European Union member states, the data are derived from a conversion of WTO-US Department of Agriculture/Environmental Resource Service online data. See: http://www.ers.usda.gov/db/Wto/AMS_database/Default.asp?ERSTab=3 Table DS-4 (accessed October 2005). For the 15 member states of the European Union, the data are taken from the Annexes to the Commission Staff Working Document [SEC(2004)1311 – 27.10.2004] Accompanying the 33rd Financial Report on the European Agricultural Guidance and Guarantee Fund, Guarantee Section - 2003 Financial Year [COM(2004)715 final], online at http://europa.eu.int/comm/agriculture/fin/finrep03/annexe_fr.pdf (accessed 17 November 2005). The subsidies are adjusted for environmental payments, which in many cases constitute positive subsidies, and then standardized by agricultural value added. The agricultural value added figures for the EU15 countries are drawn from Eurostat online http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136206,0_45570467&_dad=portal&_schema=PORTAL (accessed 17 November 2005), for the remaining countries the source is WTO_US Agriculture/Environmental Resource Service online (see above). Environmental Payments are drawn from Table DS-1 from the WTO-US online source (see above). For Taiwan we used an agricultural tarrifs figure from the Taiwan Yearbook at

http://english.www.gov.tw/Yearbook/index.jsp?categid=160&recordid=83352.

Methodology For each country, available information on governmental or supra-governmental (EU15) agricultural payments were converted to US dollars using the average applicable currency exchange rate for the corresponding year. Although quite varied over countries, these are the subsidies that have been linked in the scientific literature to more intensive agricultural production patterns and associated environmental damages. The resulting data are then adjusted for environmental payments in US dollars ("Green Box" subsidies) taken from Table DS-1 of the WTO-US source and divided by agricultural value added in US dollars. Only environmental payments were used since they represent the cleanest measure of positive environmental payments in the Green Box category. This may therefore exclude some other positive environmental payments such as land conservation programs. Some countries have negative values, which represent either net taxes, more likely from administered prices than actual taxation of producers or cases where Green Box payments exceed total AMS payments.

Indicator AGSUBEPI **Collection** EPI 2006

Indicator # 31 **Sub-Index**

Indicator Name Agricultural Subsidies (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year Average of available annual data for the period 1995-2001

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable AGSUBRAW, the data were converted to a proximity to target measure, with agricultural subsidies of 0% being the target.

Indicator OVRFSHRAW **Collection** EPI 2006

Indicator # 32 **Sub-Index**

Indicator Name Productivity Overfishing

Units Score between 1 and 7 with high scores corresponding to overfishing

Reference Year Average for 1993-1998

Source Environmental Vulnerability Index, Indicator 34 "Productivity overfishing". Available from: http://www.sopac.org/tiki/tiki-index.php?page=EVI (accessed December 2005). For Fisheries data: Food and Agriculture Organization (FAO), United Nations, 1993-1998; For Productivity data: University of British Columbia.

Methodology This measure is drawn from the Environmental Vulnerability Index (EVI) prepared by the South Pacific Applied Geoscience Commission (SOPAC) in partnership with UNEP and other support. The indicator's categories are based on the ratio of fisheries productivity to fish catch, or specifically the ratio of tonnes of carbon per square kilometer of exclusive economic zone per year to tonnes of fish catch per kilometer square of shelf per year. The score ranges represent the following: 1=[>=3.2 millions], 2=(3.2-1.2 millions], 3=(1.2 millions - 442 thousand], 4=(442-163 thousand] ,5=(163-60 thousand], 6=(60-22 thousand], 7=(<=22 thousand]. Taiwan provided its own data.

Indicator	OVRFSHEPI	**Collection**	EPI 2006
Indicator #	33	**Sub-Index**	
Indicator Name	Overfishing (proximity to target)		
Units	Proximity to target (0-100 range with 100 being the target)		
Reference Year	Average for 1993-1998		
Source	Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.		
Methodology	Based on the variable OVERFSHRAW, the index was then converted to a proximity to target measure, with a productivity overfishing index of 1 being the target.		

Indicator	ENEFFRAW	**Collection**	EPI 2006
Indicator #	34	**Sub-Index**	
Indicator Name	Energy Efficiency		
Units	Terajoules per million GDP (constant 2000 international PPP)		
Reference Year	1994-2003		
Source	For energy consumption data: Energy Information Administration, International Energy Annual 2003, which is available online at: http://www.eia.doe.gov/emeu/iea/wecbtu.html (Table E.1) and was posted on 1 July 2005. Accessed on 5 October 2005. For GDP data: World Bank, World Development Indicators 2003, GDP in PPP, http://devdata.worldbank.org/dataonline/ accessed 5 October 2005. Alternative GDP data as follows: Afganistan, Bhutan, Cuba, Democratic Republic of Congo, Iraq, Liberia, Libya, Myanmar, Romania, Serbia & Montenegro, Somalia, and Suriname: CIA World Factbook 2004 adjusted to 2000 Dollars using GDP deflator from NASA GDP Deflator: http://www1.jsc.nasa.gov/bu2/inflateGDP.html.		
Methodology	Notes from IEA 2003: Data for the most recent year are preliminary. Total primary energy consumption reported in this table includes the consumption of petroleum, dry natural gas, coal, and net hydroelectric, nuclear, and geothermal, solar, wind, and wood and waste electric power. Total primary energy consumption for each country also includes net electricty imports (electricity imports minus electricity exports) from Table S.6 . Electricity net imports are included because the net electricity consumption by energy type data noted above are really net electricity generation data that have not been adjusted to include electricity imports and exclude electricity exports. Total primary energy consumption for the United States also includes the consumption of geothermal, solar, and wood and waste energy not used for electricity generation from Table E.8. The original data are in quadrillion BTU (10^15 BTU), which are converted to Terajoule using the conversion factor: 10^15 BTU=1055055.9 Terajoule. Conversion factor taken from http://www.onlineconversion.com/energy.htm (accessed 17 November 2005).		

Indicator	ENEFFEPI	**Collection**	EPI 2006
Indicator #	35	**Sub-Index**	
Indicator Name	Energy Efficiency (proximity to target)		

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 1994-2003

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable ENEFFRAW, the data were converted to a proximity to target measure, with 1,650 Terajoules per million US$ GDP PPP being the target (this represents the 10th percentile most energy efficient of the original EPI data set of ~250 countries).

Indicator RENPCRAW **Collection** EPI 2006

Indicator # 36 **Sub-Index**

Indicator Name Renewable Energy

Units Renewable energy production as percentage of total energy consumption

Reference Year 1994-2003

Source Renewable production and total energy consumption data: Energy Information Administration's International Energy Annual 2003, available online at: http://www.eia.doe.gov/emeu/iea/wecbtu.html (data posted on 24 June 2005. Accessed on 5 October 2005.)

Methodology Hydroelectric, biomass, geothermal, solar and wind electric power production were calculated as a percent of total energy consumption. Some countries exceed 100 percent because they are net exporters of renewable energy. Note that biomass energy utilized locally (e.g., fuelwood or dung burned by low income households in the developing world) are not included in these figures.

Indicator RENPCEPI **Collection** EPI 2006

Indicator # 37 **Sub-Index**

Indicator Name Renewable Energy (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 1994-2003

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable RENPCRAW, the data were converted to a proximity to target measure, with 100% renewables being the target.

Indicator CO2GDPRAW **Collection** EPI 2006

Indicator # 38 **Sub-Index**

Indicator Name CO2 per GDP

Units Metric tons of carbon emissions per million GDP in constant 1995 US dollars

Reference Year 2000

Source For CO2 emission data: Carbon Dioxide Information Analysis Center (CDIAC), http://cdiac.esd.ornl.gov/trends/emis/tre_coun.htm; For GDP data: World Bank World Development Indicators 2004, GDP in constant 1995 US dollars. Alternative GDP data as follows: Peoples Republic of Korea: from United Nations Statistics Division Common Database (UNCDB), GDP at market prices, current prices, USD for 2000 (UN Estimates), http://unstats.un.org/unsd/cdb/cdb_help/cdb_quick_start.asp; Cuba, Libya, and Myanmar: CIA World Fact Book 2001 GDP USD (PPP), http://www.cia.gov/cia/publications/factbook/ and deflated to 1995 dollars using NASA GDP Deflator: http://www1.jsc.nasa.gov/bu2/inflateGDP.html. Additional or updated country data as follows. Taiwan: CO2 data from CDIAC, http://cdiac.esd.ornl.gov/ftp/ndp030/nation00.ems, GDP data from US Energy Information Administration (EIA), B.2 World Gross Domestic Product at Market Exchange Rates, 1980-2002, http://www.eia.doe.gov/pub/international/iealf/tableb2.xls (in constant 1995 USD).

Methodology Total annual CO2 emissions in metric tons have been normalized by million GDP in constant 1995 US dollars for each country. For the People's Republic of Korea World Bank GDP data were not available and UN estimates of GDP at market prices, current prices, US$ for 2000 were used instead.

Indicator CO2GDPEPI **Collection** EPI 2006

Indicator # 39 **Sub-Index**

Indicator Name CO2 per GDP (proximity to target)

Units Proximity to target (0-100 range with 100 being the target)

Reference Year 2000

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology Based on the variable CO2GDPRAW, the data were converted to a proximity to target measure, with 0 tonnes per GDP being the target.

Collection 2: 2005 Environmental Sustainability Index

Indicator ESI2005 **Collection** ESI 2005

Indicator # 40 **Sub-Index**

Indicator Name 2005 Environmental Sustainability Index (ESI)

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2006

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New

Haven: Yale Center for Environmental Law & Policy.

Methodology The ESI score quantifies the likelihood that a country will be able to preserve valuable environmental resources effectively over the period of several decades. Put another way, it evaluates a country's potential to avoid major environmental deterioration. It represnts an unweighted average of the scores for the ESI's 21 indicators.

Indicator SYSTEM **Collection** ESI 2005

Indicator # 41 **Sub-Index**

Indicator Name Environmental Systems Component

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Environmental Systems component represents an unweighted average of the following indicators: Air Quality, Biodiversity, Land, Water Quality, and Water Quantity.

Rationale A country is more likely to be 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.

Indicator STRESS **Collection** ESI 2005

Indicator # 42 **Sub-Index**

Indicator Name Reducing Environmental Stresses

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Reducing Environmental Stresses component represents an unweighted average of the following indicators: Reducing Air Pollution, Reducing Ecosystem Stress, Reducing Population Pressure, Reducing Waste & Consumption Pressures, Reducing Water Stress, and Natural Resource Management.

Rationale A country is more likely to be environmentally sustainable if the levels of an-thropogenic stress are low enough to engender no demonstrable harm to its environmental systems.

Indicator VULNER **Collection** ESI 2005

Indicator # 43 **Sub-Index**

Indicator Name Reducing Human Vulnerability Component

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Reducing Human Vulnerability component represents an unweighted average of the following indicators: Environmental Health, Basic Human Sustenance, and Reducing Environment-Related Natural Disaster Vulnerability.

Rationale A country is more likely to be environmentally sustainable to the extent that people and social systems are not vulnerable to environmental disturbances that affect basic human wellbeing; becoming less vulnerable is a sign that a society is on a track to greater sustainability.

Indicator CAP **Collection** ESI 2005

Indicator # 44 **Sub-Index**

Indicator Name Social and Institutional Capacity Component

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Social and Institutional Capacity component represents an unweighted average of the following indicators: Environmental Governance, Eco-Efficiency, Private Sector Responsiveness, and Science and Technology.

Rationale A country is more likely to be 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.

Indicator GLOBAL **Collection** ESI 2005

Indicator # 45 **Sub-Index**

Indicator Name Global Stewardship Component

Units Unitless scale (ranging from theoretical minimum of 0 [bad] to a maximum of 100 [good])

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The Global Stewardship component represents an unweighted average of the following indicators: Participation in International Collaborative Efforts, Greenhouse Gas Emissions, and Reducing Transboundary Environmental Pressures.

Rationale A country is more likely to be 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.

Indicator	SYS_AIR	**Collection**	ESI 2005
Indicator #	46	**Sub-Index**	
Indicator Name	Air Quality Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The SYS_AIR indicator represents the unweighted average of the following variables: NO2, SO2, TSP, and INDOOR.		

Indicator	SYS_LAN	**Collection**	ESI 2005
Indicator #	47	**Sub-Index**	
Indicator Name	Land Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The SYS_LAN indicator represents the unweighted average of the following variables: ANTH10 and ANTH40.		

Indicator	SYS_WQL	**Collection**	ESI 2005
Indicator #	48	**Sub-Index**	
Indicator Name	Water Quality Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The SYS_WQL indicator represents the unweighted average of the following variables: WQ_DO, WQ_EC, WQ_PH, WQ_SS		

Indicator	SYS_WQN	**Collection**	ESI 2005
Indicator #	49	**Sub-Index**	

Indicator Name Water Quantity Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The SYS_WQN indicator represents the unweighted average of the following variables: WATAVL and GRDAVL.

Indicator	SYS_BIO	**Collection**	ESI 2005
Indicator #	50	**Sub-Index**	

Indicator Name Biodiversity Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc A. Levy, Tanja Srebotnjak, Alexander de Sherbinin, Christine H. Kim, and Bridget Anderson. (2006). Pilot 2006 Environmental Performance Index. New Haven: Yale Center for Environmental Law & Policy, and Palisades NY: Center for International Earth Science Information Network (CIESIN), Columbia University.

Methodology The SYS_BIO indicator represents the unweighted average of the following variables: ECORISK, PRTBRD, PRTMAM, PRTAMPH, and NBI.

Indicator	GLO_COL	**Collection**	ESI 2005
Indicator #	51	**Sub-Index**	

Indicator Name Participation in International Collaborative Efforts Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The GLO_COL indicator represents the unweighted average of the following variables: EIONUM, FUNDING, and PARTICIP.

Indicator	GLO_GHG	**Collection**	ESI 2005
Indicator #	52	**Sub-Index**	

Indicator Name Greenhouse Gas Emissions Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The GLO_GHG indicator represents the unweighted average of the following variables: CO2GDP and CO2PC.

Indicator	GLO_TBP	**Collection**	ESI 2005
Indicator #	53	**Sub-Index**	

Indicator Name Reducing Transboundary Environmental Pressures Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The GLO_TBP indicator represents the unweighted average of the following variables: S02EXP and POLEXP.

Indicator	STR_AIR	**Collection**	ESI 2005
Indicator #	54	**Sub-Index**	

Indicator Name Reducing Air Pollution Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The STR_AIR indicator represents the unweighted average of the following variables: COALKM, NOXKM, SO2KM, VOCKM, and CARSKM.

Indicator	STR_ECO	**Collection**	ESI 2005
Indicator #	55	**Sub-Index**	
Indicator Name	Reducing Ecosystem Stress Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The CAP_ST indicator represents the unweighted average of the following variables: FOREST and ACEXC.		

Indicator	STR_POP	**Collection**	ESI 2005
Indicator #	56	**Sub-Index**	
Indicator Name	Reducing Population Pressure Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The STR_POP indicator represents the unweighted average of the following variables:GR2050 and TFR.		

Indicator	STR_WAS	**Collection**	ESI 2005
Indicator #	57	**Sub-Index**	
Indicator Name	Reducing Waste & Consumption Pressure Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The STR_WAS indicator represents the unweighted average of the following variables: EFPC, RECYCLE, and HAZWST.		

Indicator	STR_WAT	**Collection**	ESI 2005
Indicator #	58	**Sub-Index**	

Indicator Name Reducing Water Stress Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The STR_WAT indicator represents the unweighted average of the following variables: BODWAT, FERTHA
PESTHA, and WATSTR.

Indicator	STR_NRM	**Collection**	ESI 2005
Indicator #	59	**Sub-Index**	

Indicator Name Natural Resoruce Managemnet Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The STR_NRM indicator represents the unweighted average of the following variables: OVRFSH, FORCERT, WEFSUB, IRRSAL, and AGSUB.

Indicator	VUL_HEA	**Collection**	ESI 2005
Indicator #	60	**Sub-Index**	

Indicator Name Environmental Health Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The VUL_HEA indicator represents the unweighted average of the following variables: DISINT, DISRES, and U5MORT.

Indicator	VUL_SUS	**Collection**	ESI 2005
Indicator #	61	**Sub-Index**	
Indicator Name	Basic Human Sustenance Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The VUL_SUS indicator represents the unweighted average of the following variables: UND_NO and WATSUP.		

Indicator	VUL_DIS	**Collection**	ESI 2005
Indicator #	62	**Sub-Index**	
Indicator Name	Reducing Environment-Related Natural Disaster Vulnerability Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The VUL_DIS indicator represents the unweighted average of the following variables: DISCAS and DISEXP.		

Indicator	CAP_GOV	**Collection**	ESI 2005
Indicator #	63	**Sub-Index**	
Indicator Name	Environmental Goverance Indicator		
Units	Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')		
Reference Year	2005		
Source	Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.		
Methodology	The CAP_GOV indicator represents the unweighted average of the following variables: GASPR, GRAFT, GOVEFF, PRAREA, WEFGOV, LAW, AGENDA21, CIVLIB, CGSDI, IUCN, KNWLDG, and POLITY.		

Indicator	CAP_EFF	**Collection**	ESI 2005
Indicator #	64	**Sub-Index**	

Indicator Name Eco-Efficiency Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The CAP_EFF indicator represents the unweighted average of the following variables:ENEFF and RENPC.

Indicator	CAP_PRI	**Collection**	ESI 2005
Indicator #	65	**Sub-Index**	

Indicator Name Private Sector Responsiveness Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The CAP_PRI indicator represents the unweighted average of the following variables: DJSGI, ECOVAL, ISO14, WEFPRI, and RESCARE.

Indicator	CAP_ST	**Collection**	ESI 2005
Indicator #	66	**Sub-Index**	

Indicator Name Science and Technology Indicator

Units Z-score (mean is 0, +1 and -1 are plus and minus one standard deviation above the mean, high numbers are 'good')

Reference Year 2005

Source Esty, Daniel C., Marc Levy, Tanja Srebotnjak, and Alexander de Sherbinin (2005). 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law & Policy.

Methodology The CAP_ST indicator represents the unweighted average of the following variables: INNOV, DAI, PECR, ENROL, and RESEARCH.

Indicator	NO2	**Collection**	ESI 2005
Indicator #	67	**Sub-Index**	

Indicator Name Urban population weighted NO2 concentration

Units Micrograms per cubic meter

Reference Year MRYA 1993-2004

Source For ambient air pollutant concentrations: Organisation for Economic Co-operation and Development (OECD), Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); United Nations Human Settlement Programme (UNHABITAT), Global Urban Observatory, Citibase, 1999, http://www.unchs.org/programmes/guo/guo_databases.asp (accessed July 2004); World Health Organization (WHO), Air Monitoring Information System 2.0, 1998; European Environment Agency, AirBase, July 2004, http://air-climate.eionet.eu.int/databases (accessed July 2004); World Resources Institute, World Resources 1998-99, Data Table 8.5;
For city population data: OECD Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); Center for International Earth Science Information Network (CIESIN), Europe_CityPop_alpha database (version of August 2004).
Additional and updated data as follows. Canada: Air quality data: National Air Pollution Surveillance (NAPS) Network, Annual Data Summary for 2002, http://www.etc-cte.ec.gc.ca/publications/naps/naps2002_annual.pdf, Population data: Statistics Canada, http://www.statcan.ca/english/Pgdb/demo05a.htm. Finland: Finnish Meteorological Institute, 2004. Slovak Republic: NO2 data: Slovak Hydrometeorolotical Institute, Ministry of Environment of the Slovak Republic, "Air pollution in the Slovak Republic in 2001", Bratislava 2003 (http://oko.shmu.sk/rocenky/SHMU_Air_pollution_in_the_SR_2001.pdf), to be published by Statistical Office of the Slovak Republic in "Statistical Yearbook of the Slovak Republic 2004" and "Environment in the Slovak Republic Selected indicators in 1999 - 2003", City population data: Statistical Office of the Slovak Republic, Demography and Social Statistics Section. Taiwan: Environmental Protection Agency, Taiwan, Air Quality Query Website, http://edb.epa.gov.tw/EnvStatistics/AirQlt/airpoll/Air_pollution_tb3_1.asp. United Arab Emirates: Federal Environment Agency 2004, Environmental Annual Reports collected by respective municipalities.

Methodology The data from all sources were normalized by city population (in thousands) in each country. The most recent data were used from the OECD, UNHABITAT, and WHO. The EEA data were drawn from the AirBase air quality monitoring database and station coverage was balanced with the need for recent data. If a country has observations from more than one data source, the most recent observation was chosen.

Rationale Poor ambient air quality affects both human and ecosystem health. Humans exposed to high NO2 concentrations may suffer respiratory illness and lung damage. NO2 is also a precursor to the formation of ground-level ozone and acid rain. Through reactions of NO2 with other substances such as volatile organic compounds (VOC) in the atmosphere can cause reduced visibility.

Indicator	SO2	**Collection**	ESI 2005
Indicator #	68	**Sub-Index**	

Indicator Name Urban population weighted SO2 concentration

Units Micrograms per cubic meter

Reference Year MRYA 1993-2004

Source For ambient air pollutant concentrations: Organisation for Economic Co-operation and Development (OECD), Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); United Nations Human Settlement Programme (UNHABITAT), Global Urban Observatory, Citibase, 1999, http://www.unchs.org/programmes/guo/guo_databases.asp (accessed July 2004); World Health Organization (WHO), Air Monitoring Information System 2.0, 1998; European Environment Agency, AirBase, July 2004, http://air-climate.eionet.eu.int/databases (accessed July 2004); World Resources Institute, World Resources 1998-99, Data Table 8.5;
For city population data: OECD Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); Center for International Earth Science Information Network (CIESIN), Europe_CityPop_alpha database (version of August 2004).
Additional and updated country data as follows. Belgium: Interregional Cell for the Environment (IRCEL), Frans Fierens, and Walloon State of the Environment Cell - Directorate-General for Natural Resources and the Environment (CEEW - DGRNE), Vincent Brahy. http://statbel.fgov.be. Canada: SO2 data, National Air Pollution Surveillance (NAPS) Network, Annual Data Summary for 2002, http://www.etc-cte.ec.gc.ca/publications/naps/naps2002_annual.pdf. City population data, http://www.statcan.ca/english/Pgdb/demo05a.htm. Taiwan: SO2 data, Environmental Protection Administration (EPA), Taiwan, http://edb.epa.gov.tw/EnvStatistics/AirQlt/airpoll/index.asp http://www.dgbas.gov.tw/dgbas03/bs8/look/looky.htm. City population data, Directorate General of Budget Accounting and Statistics, The Third Bureau, Socio-Economic Data of Taiwan. Turkey: SO2 data, Ministry of Health, http://www.die.gov.tr/ENGLISH/SONIST/CEVRE/e05052004.html. City population data, State Institute of Statistics., General Population Census 2000. United Arab Emirates: Federal Environment Agency, Environmental Annual Reports collected in respective municipalities.

Methodology The data from all sources were normalized by city population (in thousands) in each country. The most recent data were used from the OECD, UNHABITAT, and WHO. The EEA data were drawn from the AirBase air quality monitoring database and station coverage was balanced with the need for recent data. If a country has observations from more than one data source, the most recent observation was chosen.

Rationale Poor ambient air quality affects both human and ecosystem health. Humans exposed to high SO2 concentrations, especially asthmatics, may suffer from respiratory tract problems and permanent damage to lung tissue as a result of long-term exposure. SO2 is an important precursor to the formation of acid rain and fog, which changes the composition of soils, causes acidification of water bodies, and negatively affects animal and plant growth. In many locations, SO2 particles in the atmosphere are the largest source of haze and impaired visibility.

Indicator TSP **Collection** ESI 2005

Indicator # 69 **Sub-Index**

Indicator Name Urban population weighted TSP concentration

Units Micrograms TSP per cubic meter

Reference Year MRYA 1993-2002

Source For ambient air pollutant concentrations: Organisation for Economic Co-operation and Development (OECD), Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); United Nations Human Settlement Programme (UNHABITAT), Global Urban Observatory, Citibase, 1999, http://www.unchs.org/programmes/guo/guo_databases.asp (accessed July 2004); World Health Organization (WHO), Air Monitoring Information System 2.0, 1998; European Environment Agency, AirBase, July 2004, http://air-climate.eionet.eu.int/databases (accessed

July 2004); World Resources Institute, World Resources 1998-99, Data Table 8.5;
For city population data: OECD Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004); Center for International Earth Science Information Network (CIESIN), Europe_CityPop_alpha database (version of August 2004).
Additional and updated country data as follows. Albania: Ministry of Environment Canada: PM10 data: National Air Pollution Surveillance (NAPS) Network, Annual Data Summary for 2002, http://www.etc-cte.ec.gc.ca/publications/naps/naps2002_annual.pdf, City population data: http://www.statcan.ca/english/Pgdb/demo05a.htm. Costa Rica: TSP data: Universidad Nacional, Heredia, CostaRica, Laboratorio de Contaminantes cited by Indicadores del Desarrollo Sostenible de Costa Rica 2002, Observatorio del Desarrollo (OdD), Universidad de Costa Rica, http//www.odd.ucr.ac.cr. Slovak Republic: PM10 data: Slovak Hydrometeorolotical Institute, Ministry of Environment of the Slovak Republic, "Air pollution in the Slovak Republic in 2001", Bratislava 2003 (http://oko.shmu.sk/rocenky/SHMU_Air_pollution_in_the_SR_2001.pdf), to be published by Statistical Office of the Slovak Republic in "Statistical Yearbook of the Slovak Republic 2004" and "Environment in the Slovak Republic Selected indicators in 1999 - 2003", City population data: Statistical Office of the Slovak Republic, Demography and Social Statistics Section. Taiwan: PM10 data, Air Quality QueryWebsite, EPA, Taiwan, http://edb.epa.gov.tw/EnvStatistics/AirQlt/airpoll/Air_pollution_tb3_2.asp. Directorate General of Budget Accounting and Statistics, Socio-Economic Data of Taiwan, http://www.dgbas.gov.tw/dgbas03/bs8/look/looky.htm. United Arab Emirates: Federal Environment Agency, Environmental Annual Reports collected respective municipalities. United States: Environmental Protection Agency, http://www.epa.gov/air/airtrends/aqtrnd01/pmatter.html

Methodology The data from all sources were normalized by city population (in thousands) in each country. The most recent data were used from the OECD, UNHABITAT, and WHO. The EEA data were drawn from the AirBase air quality monitoring database and station coverage was balanced with the need for recent data. If a country has observations from more than one data source, the most recent observation was chosen. All data refer to Total Suspended Particulates (TSP) except for the EEA and some individual country data points, which refer to PM10 (aerodynamic diameter less than 10 micrometers). The conversion factor applied to convert from PM10 to TSP is 1.1. TSP value for the USA represents a crude estimate based on information shown in first chart on website, http://www.epa.gov/air/airtrends/aqtrnd01/pmatter.htmland its value is not population weighted due to lack of information on the population living near the monitoring

Rationale Poor ambient air quality affects both human and ecosystem health. Many studies have linked exposure to particulate matter (PM) to adverse health effects in humans such as increased asthma attacks, chronic bronchitis, decreased lung function, and premature death. PM can travel over long distances and is a significant contributor to reduced visibility. The deposition of PM can change the nutrient composition of soils and surface waters and affects the diversity of ecosystems.

Indicator	INDOOR	**Collection**	ESI 2005
Indicator #	70	**Sub-Index**	

Indicator Name Indoor air pollution from solid fuel use

Units Percentage of households using solid fuels, adjusted for ventilation

Reference Year 2004

Source World Health Organization, "Assessing the environmental burden of disease at national and local levels", by Manish A. Desai, Sumi Mehta, Kirk R. Smith, http://www.who.int/quantifying_ehimpacts/publications/9241591358/en/ (accessed December 2004).

Methodology Solid fuel use is defined as the household combustion of coal or biomass (such as dung, charcoal, wood, or crop residues). The approach taken in WHO guidelines is based on a binary classification scheme for exposure levels, separating the study population into those exposed to solid fuel use and those not exposed followed by the application of relative risks derived from a comprehensive review of the current epidemiological literature on solid fuel use. Central estimates were used. For China, original data was provided separately for children and adults and these values were averaged. A single value was provided and applied to both Ethiopia and Eritrea. Corrections are made for variation in prevailing ventilation

Rationale The public health community has drawn attention to the deleterious effects of indoor air pollution, especially on women who cook inside using solid fuels. High exposure to the fumes from solid fuel combustion is dangerous to human health. Solid fuel use has further consequences for deforestation and soil depletion because of dung collection.

Indicator ECORISK **Collection** ESI 2005

Indicator # 71 **Sub-Index**

Indicator Name Percentage of country's territory in threatened ecoregions

Units Percentage of country's territory in threatened ecoregions

Reference Year 2004

Source Hoekstra, Jonathan M., Timothy M. Boucher, Taylor H. Ricketts, and Carter Roberts. 2005. Confronting a biome crisis: global disparities of habitat loss and protection. Ecology Letters, 8, pp. 23-29, see also http://www.blackwellpublishing.com/abstract.asp?aid=4&iid=1&ref=1461-023X&vid=8 (accessed January 2005).

Methodology The authors identify the world's terrestrial biomes and ecoregions in which biodiversity and ecological function is at greatest risk because of extensive habitat conversion and limited habitat protection. Threatened ecoregions are ecoregions with high ratios of habitat conversion to habit protection that are classified as vulnerable, endangered, or critical. This yields the land area of terrestrial ecosystems that is threatened, and the percent land area in each country that is in a threatned ecoregion. The original data distinguished between Gaza Strip and West Bank; between Montenegro and Serbia; between Jan Mayen and Svalbard. These have been combined by normalizing the percent area of ecoregions in crisis by their land area. Furthermore, the figures for France exclude the overseas territories of French Southern and Antarctic Lands. The figures for the United Kingdom exclude Guernsey, Jersey, and Isle of Man. The figures for the United States of America exclude Howland Island, Jarvis Island, Johnston Atoll, Midway Islands, and Wake Island.

Rationale Species extinction is just one aspect of the threats to biodiversity. Whole biomes (plant and animal assemblages) are also at significant risk of disappearing. Habitat conversion exceeds habitat protection by a ratio of 8:1 in temperate grasslands and Mediterranean biomes, and 10:1 in more than 140 ecoregions. These regions include some of the most biologically distinctive, species rich ecosystems on earth, as well as the last home of many threatened and endangered species.

Indicator PRTBRD **Collection** ESI 2005

Indicator # 72 **Sub-Index**

Indicator Name Threatened bird species as percentage of known breeding bird species in each country

Units Threatened bird species as percentage of known breeding bird species in each country

Reference Year MRYA 2002-2003

Source IUCN-The World Conservation Union Red List of Threatened Species 2002 and 2003, http://www.redlist.org/info/tables.html (accessed September 2004), and World Resources Institute (WRI) 2000-2001 Earthtrends Table BI.2 Globally Threatened Species: Mammals, Birds, and Reptiles, http://earthtrends.wri.org/pdf_library/data_tables/bi2n_2000.pdf (accessed January 2005).
Additional and updated country data as follows. Taiwan: The Agricultural Council, Taiwan, Birds, Animal Division, Endemic Species Research Center, http://www.tesri.gov.tw/content/animal/ani_bird.asp,
Wild Bird Federation Taiwan, The list of conserved wild animals, http://www.bird.org.tw/ebird/b/webrace/school/10/new_page_4.htm.

Methodology The number of bird species threatened divided by known breeding bird species in the country, expressed as a percent. Threatened species include those that are listed as "Critically Endangered, Endangered, or Vulnerable," but excludes sub-species, introduced species, species whose status is insufficiently known (categorized by the World Conservation Union or IUCN as "data deficient"), those known to be extinct, and those for which status has not been assessed (categorized by IUCN as "not evaluated"). The number of species that are globally listed as Critically Endangered are known to occur in the country but do not imply that the species are threatened within the country itself.

Rationale The percent of breeding birds threatened gives an estimate of a country's success at preserving its biodiversity.

Indicator PRTMAM **Collection** ESI 2005

Indicator # 73 **Sub-Index**

Indicator Name Threatened mammal species as percentage of known mammal species in each country

Units Threatened mammal species as percentage of known mammal species in each country

Reference Year MRYA 2002-2003

Source IUCN-The World Conservation Union Red List of Threatened Species 2002 and 2003, http://www.redlist.org/info/tables.html (accessed September 2004), and World Resources Institute (WRI) 2000-2001 Earthtrends Table BI.2 Globally Threatened Species: Mammals, Birds, and Reptiles, http://earthtrends.wri.org/pdf_library/data_tables/bi2n_2000.pdf (accessed January 2005).
Additional and updated country data as follows. Taiwan: The Agricultural Council, Taiwan, Mammal, Animal Division, Endemic Species Research Center, http://www.tesri.gov.tw/content/animal/ani_mamal.asp, Endemic Species Research Center, The list of conserved wild animals,

Methodology The number of mammal species threatened was divided by known mammal species in the country, and expressed as a percent. Mammals threatened were normalized by mammals known in each country. Mammals species and number threatened includes all species of mammals that are recorded as threatened and that are known to occur in a given country. Threatened species include those that are listed as "Critically Endangered, Endangered, or Vulnerable," but excludes sub-species, introduced species, species whose status is insufficiently known (categorized by the World Conservation Union or IUCN as "data deficient"), those known to be extinct, and those for which status has not been assessed (categorized by IUCN as "not evaluated"). Number of mammal species refers to the total number of mammal species identified and documented in a particular country or region, but excludes data on cetaceans. Total numbers include both endemic and non-endemic species. The total number of known species may include introduced species. The exclusion of cetaceans may therefore lead to overestimation for coastal countries with threatened whale and porpoise populations. The number of species that are globally listed as Critically Endangered are known to occur in the country but do not imply that the species are threatened within the country itself.

Rationale The percent of mammals threatened gives an estimate of a country's success at preserving its biodiversity.

Indicator PRTAMPH **Collection** ESI 2005

Indicator # 74 **Sub-Index**

Indicator Name Threatened amphibian species as percentage of known amphibian species in each country

Units Threatened amphibian species as percentage of known breeding amphibian species in each country

Reference Year 2004

Source IUCN-The World Conservation Union Species Survival Commission, Conservation International-Center for Applied Biodiversity Science, and NatureServe. 2004, IUCN Global Amphibian Assessment, http://www.globalamphibians.org/ (accessed January 2005).

Methodology The number of amphibian species threatened divided by known amphibian species in the country, expressed as a percent. Threatened species include those that are listed as "Critically Endangered, Endangered, or Vulnerable," but excludes sub-species, introduced species, species whose status is insufficiently known (categorized by the World Conservation Union or IUCN as "data deficient"), those known to be extinct, and those for which status has not been assessed (categorized by IUCN as "not evaluated").

Rationale The percent of amphibians threatened gives an estimate of a country's success at preserving its biodiversity.

Indicator NBI **Collection** ESI 2005

Indicator # 75 **Sub-Index**

Indicator Name National Biodiversity Index

Units Score between 0 and 1 with large values corresponding to high levels of species abundance and small values reflecting low levels of species abundance

Reference Year 2001

Source Convention on Biological Diversity, Global Biodiversity Outlook (2001, with second edition to be published in 2004), http://www.biodiv.org/doc/publications/gbo/gbo-anx-01-en.pdf (accessed January 2005).

Methodology This index represents estimates of a country's richness and endemism in four terrestrial vertebrate classes and vascular plants; vertebrates and plants are ranked equally; index values range between 1 (maximum: Indonesia) and 0 (minimum: Greenland). The NBI includes some adjustment allowing for country size. Countries with land area less than 5,000 km2 are excluded. Overseas territories and dependencies are excluded.

Rationale Biodiversity cannot be measured solely in terms of threat. A country's extent of biodiversity is also important to assess. The NBI assesses a country's species richness by measuring species abundance.

Indicator	ANTH10	**Collection**	ESI 2005
Indicator #	76	**Sub-Index**	

Indicator Name Percentage of total land area (including inland waters) having very low anthropogenic impact

Units Percentage of a country's land and inland waters having very low anthropogenic impact ("wildness" score of 9 or below on the Human Impact Index 58-point scale)

Reference Year 2004

Source The Human Influence Index (HII) version 2, Center for International Earth Science Information Network (CIESIN) including nine underlying public domain data sets: World Roads (US Department of Defense National Imaging and Mapping Agency (NIMA) Vector MAP (VMAP0)), World Railroads (NIMA, VMAP0), Navigable Rivers (NIMA, VMAP0-hydropoly data set), Coastlines (NIMA, coastline data), GPW3 Population Density Data (CIESIN Gridded Population of the World version 3 Population Density Grid adjusted to match UN figures), GRUMP version 1 Urban Extent Data (CIESIN Gridded Rural-Urban Mapping Project, Urban extent dataset), DMSP Nighttime Stable Lights (US Department of Defense, Defense Meteorological Satellite Program), and Cropland Data (Center for Sustainability and Global Environment (SAGE), Navin Ramankutty), http://www.ciesin.org/wild_areas/ (accessed January 2005).

Methodology The HII measures anthropogenic impact of land and inland waters based on human land uses, human access from roads, railways or major rivers, electrical infrastructure, and population density. A scoring system is applied to each of 9 gridded data sets according to the degree of "wildness" of the grid tile. The 9 individual scores are then aggregated and normalized using the total area of the country. Areas that receive less than or equal to 9 points (out of a total of 58 points) on the scoring metric are included. The underlying data sets are: World Roads (US Dept. of Defense National Imaging and Mapping Agency, NIMA, VMAP0), World Railroads (NIMA, VMAP0), Navigable Rivers (NIMA, VMAP0-hydropoly data set), Coastlines (NIMA, coastline data), GPW3 Population Density Data (CIESIN Gridded Population of the World v3 Population Density Grid adjusted to match UN figures), GRUMP v1 Urban Extent Data (CIESIN Gridded Rural Urban Mapping Project, Urban extent data), DMSP Nighttime Stable Lights (US Dept. of Defense, Defense Meteorological Satellite Program), and Cropland Data (SAGE Navin Ramankutty, Center for Sustainability and Global Environment). The data are not directly comparable to the ANTH10 data shown in the 2002 ESI report due to improvements and changes in the underlying data sources.

Rationale Agricultural activities and the built environment have high impacts on the natural environment. The conversion of natural vegetation for human activity has important ecological implications. The percentage of a country's land area that has low anthropogenic impact is a measure of the degree to which wild lands, which are important for biodiversity conservation, still exist in that country.

Indicator	ANTH40	**Collection**	ESI 2005
Indicator #	77	**Sub-Index**	

Indicator Name Percentage of total land area (including inland waters) having very high anthropogenic impact

Units Percentage of a country's land and inland waters having very high anthropogenic impact ("wildness" score of 36 or higher on the Human Impact Index 58-point scale)

Reference Year 2004

Source The Human Influence Index version 2 by the Center for International Earth Science Information Network (CIESIN) using 9 underlying public domain data sets. The underlying data sets are: World Roads (US Dept. of Defense National Imaging and Mapping Agency, NIMA, VMAP0), World Railroads (NIMA, VMAP0), Navigable Rivers (NIMA, VMAP0-hydropoly data set),

Coastlines (NIMA, coastline data), GPW3 Population Density Data (CIESIN Gridded Population of the World v3 Population Density Grid adjusted to match UN figures), GRUMP v1 Urban Extent Data (CIESIN Gridded Rural Urban Mapping Project, Urban extent data), DMSP Nighttime Stable Lights (US Dept. of Defense, Defense Meteorological Satellite Program), and Cropland Data (SAGE Navin Ramankutty, Center for Sustainability and Global Environment), http://www.ciesin.org/wild_areas/ (accessed January 2005).

Methodology The HII measures anthropogenic impact of land and inland waters based on human land uses, human access from roads, railways or major rivers, electrical infrastructure, and population density. A scoring system is applied to each of 9 gridded data sets according to the degree of "wildness" of the grid tile. The 9 individual scores are then aggregated and normalized using the total area of the country. Areas that receive greater or equal to 36 points (out of a total of 58) on the scoring metric are included. The underlying data sets are: World Roads (US Dept. of Defense National Imaging and Mapping Agency, NIMA, VMAP0), World Railroads (NIMA, VMAP0), Navigable Rivers (NIMA, VMAP0-hydropoly data set), Coastlines (NIMA, coastline data), GPW3 Population Density Data (CIESIN Gridded Population of the World v3 Population Density Grid adjusted to match UN figures), GRUMP v1 Urban Extent Data (CIESIN Gridded Rural Urban Mapping Project, Urban extent data), DMSP Nighttime Stable Lights (US Dept. of Defense, Defense Meteorological Satellite Program), and Cropland Data (SAGE Navin Ramankutty, Center for Sustainability and Global Environment). The data are not directly comparable to the ANTH40 data shown in the 2002 ESI report due to improvements and changes in the underlying data sources.

Rationale Agricultural activities and the built environment have high impacts on the natural environment. The conversion of natural vegetation for human activity has important ecological implications. The percentage of a country's land area that has high anthropogenic impact is a measure of the degree to which a country's land area is dominated by high intensity land-uses.

Indicator	WQ_DO	**Collection**	ESI 2005
Indicator #	78	**Sub-Index**	

Indicator Name Dissolved oxygen concentration

Units Milligrams dissolved oxygen per liter water

Reference Year MRYA 1993-2002

Source United Nations Environment Programme (UNEP), Global Environmental Monitoring System/Water Quality Monitoring System, http://www.gemswater.org/publications/index-e.html, Organisation for Economic Co-operation and Development (OECD) Environmental Data Compendium 2002, Inland Water, 3.4A, http://www.oecd.org/dataoecd/8/19/2958157.pdf (accessed June 2004), European Environment Agency (EEA) Water Base: QUALITY_LAKES_EN_V4, http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=661 (accessed June 2004), QUALITY_RIVERS_EN_V4, http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=660 (accessed June 2004).
Additional and updated country data as follows. Belgium: Vlaamse Milieumaatschappij - Flemish Environment Agency (VMM), Rudy Vannevel, Direction Générale des Ressources Naturelles et de l'Environnement (DGRNE), Dominique Wyllock, data sent to United Nations Environment Programme - Global Environment Monitoring System/Water Division (UNEP-GEMS/Water). Finland: Finnish Environment Institute, Common Procedures for Exchange of Information (Council Decision 77/795/EEC). Japan: Ministry of the Environment, http://www.env.go.jp/water/suiiki/index.html. Slovak Republic: Slovak Hydrometeorological Institute, to be published in "Environment in the Slovak Republic (Selected indicators in 1999 - 2003)" by Statistical Office of the Slovak Republic. Taiwan: Environmental Protection Administration, The Statistical Yearbook of EPA, http://www.epa.gov.tw/statistics/統計年報/91年版/3 水質/3302.htm.

Methodology For GEMS water data: for Dissolved Oxygen (DO), three codes are chosen: 08101, 08102 and 08107. Among them, 08101 was used in the ESI 2002 report and 08107 was used only by New Zealand. The value for each country was the mean of all the stations. For those countries that had both 08101 and 08102 values, the mean of both values was calculated as the value for the country. The data range from 1994 to 2002. OECD data range from 1997 to 1999. EEA data cover the period between 2000 and 2002. For some countries, the original data contained a detection flag if the data fell below the detection limit, or the smallest concentration of a substance that can still be detected with at least 95% probability. The limit of determination was the smallest concentration of a substance that can still be determined as being different from 0 with at least 95% probability. If the limit of detection flag was set, it can be assumed with probability >=95% that the substance was not in the water. In order to do the calculations, those observations were set to 0. GEMS water data was the main data source and OECD data and EEA data were used to fill in the blanks. If a country had both OECD and EEA values, OECD data were used. For water quality of lakes, Oxygen Concentration as equivalent to DO was used. For Romania no OECD data were available and the EEA value of zero was used instead.

Rationale A measure of eutrophication, which has an important impact on the health of aquatic resources and ecosystems. High levels correspond to low eutrophication.

Indicator WQ_EC **Collection** ESI 2005

Indicator # 79 **Sub-Index**

Indicator Name Electrical conductivity

Units Micro-Siemens per centimeter

Reference Year MRYA 1994-2002

Source United Nations Environment Programme (UNEP), Global Environmental Monitoring System/Water Quality Monitoring System, http://www.gemswater.org/publications/index-e.html (accessed June 2004),
European Environment Agency (EEA) Water Base: QUALITY_LAKES_EN_V4, http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=661 (accessed June 2004).
Additional and updated country data as follows. Belgium: Vlaamse Milieumaatschappij - Flemish Environment Agency (VMM), Rudy Vannevel, Direction Générale des Ressources Naturelles et de l'Environnement (DGRNE), Dominique Wyllock, data sent to United Nations Environment Programme - Global Environment Monitoring System/Water Division (UNEP-GEMS/Water). Finland: Finnish Environment Institute, Common Procedures for Exchange of Information (Council Decision 77/795/EEC). Taiwan: Environmental Protection Administration, The Statistical Yearbook of EPA, http://www.epa.gov.tw/statistics/統計年報/91 年版/3 水質/3302.htm#P2.

Methodology For GEMS water data: for Electrical Conductivity (EC), three codes were chosen: 02040, 02041 and 02049. Among them, 02041was used in the ESI 2002 report and 02049 was used only by New Zealand. The value for each country was the average across all stations. For countries that have both 02040 and 02041 values, the average of both values was calculated. OECD data do not include data for the European Community and the EEA data only cover lakes for the European Community.

Rationale A widely used bulk measure of metals concentration and salinity. High levels of conductivity correspond to high concentrations of metals.

Indicator	WQ_PH	**Collection**	ESI 2005
Indicator #	80	**Sub-Index**	

Indicator Name Phosphorus concentration

Units Milligrams phosphorus per liter water

Reference Year MRYA 1994-2003

Source United Nations Environment Programme (UNEP), Global Environmental Monitoring System/Water Quality Monitoring System, http://www.gemswater.org/publications/index-e.html (accessed June 2004), European Environment Agency (EEA) Water Base: QUALITY_LAKES_EN_V4, http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=661 (accessed June 2004), European Environment Agency (EEA) Water Base: QUALITY_RIVERS_EN_V4, http://dataservice.eea.eu.int/dataservice/metadetails.asp?id=660 3 (accessed June 2004), Organisation for Economic Co-operation and Development (OECD) Environmental Data Compendium 2002, Inland Water, 3.4D, http://www.oecd.org/dataoecd/8/19/2958157.pdf (accessed April 2004).
Additional and updated country data as follows. Finland: Finnish Environment Institute, Common Procedures for Exchange of Information (Council Decision 77/795/EEC). Slovak Republic: Slovak Hydrometeorological Institute, to be published in "Environment in the Slovak Republic (Selected indicators in 1999 - 2003)" by Statistical Office of the Slovak Republic. Taiwan: Environmental Protection Administration (EPA), Reservoir Monitoring Database, http://alphapc.epa.gov.tw/get_river_fixed.html, http://alphapc.epa.gov.tw/get_dam_fixed.html. Zimbabwe: Harare City Health Department, Zimbabwe.

Methodology For GEMS water data: for Phosphorus Concentration (PH), three codes were chosen: 15403, 15405 and 15406. Among them 15405 was used in the ESI 2002 report and 15406 was used only by New Zealand. The value for each country represents the average across all stations. 15403 values were used to fill in the blanks. For Japan, phosphorus concentration values for the 1997-1999 time period were available for both codes, but deviated substantially. Therefore, only data for code 15405 were used; the same as in the ESI 2002. The OECD data cover 1997 to 1999. The EEA data cover 2000-2002. For some countries, the original data contained a detection flag if the data fell below the detection limit, or the smallest concentration of a substance that can still be detected with at least 95% probability. The limit of determination was defined as the smallest concentration of a substance that can still be determined as being different from 0 with at least 95% probability. If the limit of detection flag was set, it can be assumed with a probability >=95% that the substance was not in the water. In order to do the calculations, those observations were set to 0. Two stations in Germany, stations NW08 and NW041, had abnormally large values for PH in 2002 indicating an error. These values were not included. GEMS data took precedence over OECD and EEA data.

Rationale A measure of eutrophication, which affects aquatic resources health. High levels correspond to high eutrophication.

Indicator	WQ_SS	**Collection**	ESI 2005
Indicator #	81	**Sub-Index**	

Indicator Name Suspended solids

Units Milligrams suspended solids per liter water

Reference Year MRYA 1994-2003

Source United Nations Environment Programme (UNEP), Global Environmental Monitoring System/Water Quality Monitoring System. http://www.gemswater.org/publications/index-e.html (accessed June 2004).
Additional and updated country data as follows. Belgium: Vlaamse Milieumaatschappij - Flemish Environment Agency (VMM), Rudy Vannevel, Direction Générale des Ressources Naturelles

et de l'Environnement (DGRNE), Dominique Wyllock, data sent to United Nations Environment Programme - Global Environment Monitoring System/Water Division (UNEP-GEMS/Water). Japan: Ministry of the Environment, http://www.env.go.jp/water/suiiki/index.html. Slovak Republic: Slovak Hydrometeorological Institute, to be published in "Environment in the Slovak Republic (Selected indicators in 1999 - 2003)" by Statistical Office of the Slovak Republic. Taiwan: Environmental Protection Administration, The Statistical Yearbook of EPA, http://www.epa.gov.tw/statistics/統計年報/91 年版/3 水質/3302.htm#P2.

Methodology For GEMS water data: for Suspended Solids (SS), two codes are chosen: 10401 and 10408. A comparison of the values for the two codes yielded substantial differences. Therefore only code 10401, the same as in the ESI 2002 report, was used. To obtain data several methods were used:
10401:SUSPENDED SOLIDS, 105 DEG. Gravimetric method. If oil and grease are present, the sample is blended. If large particles, either floating or submerged, are present, they are excluded from the sample. The sample aliquot is passed through a pre-ignited and pre-weighed Whatman GF/C filter. The filter containing the residue is placed in a porcelain dish, oven-dried at 105 o C for 2.5 hours, cooled 15 minutes in a desiccator, and weighed to a constant weight. The method detection limit is 10 mg/L. 10408:SUSPENDED SOLIDS, 180 DEG. Gravimetric method. If oil and grease are present, the sample is blended. If large particles, either floating or submerged, are present, they are excluded from the sample. A sample aliquot is passed through a pre-ignited Whatman GF/C filter. The filter containing the residue is placed in a porcelain dish, oven-dried at 180 o C for 2.5 hours, cooled 15 minutes in a desiccator and weighed to a constant weight. The method detection limit is 10 mg/L.

Rationale A measure of water quality and turbidity.

Indicator WATAVL **Collection** ESI 2005

Indicator # 82 **Sub-Index**

Indicator Name Freshwater availability per capita

Units Thousand cubic meters per person

Reference Year 1961-1995 (long-term average)

Source Center for Environmental System Research, Kassel University, Water GAP 2.1e, 2004 (communication)

Methodology The total per capita water availability was measured as the sum of internal renewable water per capita (average annual surface runoff and groundwater recharge generated from endogenous precipitation, taking into account evaporation from lakes and wetlands) and per capita water inflow from other countries. These data were derived from the WaterGap 2.1 gridded hydrological model developed by the Center for Environmental Systems Research, Kassel University, Germany. A special run of the model was performed in order to derive country-level estimates of water availability in a country. It should be noted that that the size of the grid cells (0.5 x 0.5 degree) does not accurately capture small countries. However, the fact that the model itself is based on over 30 years of global hydrological data means that the data are more comparable than similar country water resources estimates published

Rationale The per capita volume of available water resources for a country is an important indicator of environmental services and the ability to support the needs of the population.

Indicator GRDAVL **Collection** ESI 2005

Indicator # 83 **Sub-Index**

Indicator Name Internal groundwater availability per capita

Units Thousand cubic meters per capita

Reference Year 2003

Source For groundwater data: Food and Agricultural Organization, United Nations, AQUASTAT database, Groundwater produced internally (cubic km/year); For population data: Population Reference Bureau, 2004 World Population Data Sheet, total mid-year population 2004, http://www.prb.org/datafind/datafinder5.htm (accessed December 2004); For the United States of America the substitute used is Internal Renewable Water Resources: Groundwater recharge, volume in cubic kilometers for the period 1977-2001 from FAO AQUASTAT (obtained through WRI EarthTrends portal at http://earthtrends.wri.org/searchable_db/index.cfm?step=countries&cID=190&theme=2&variable_id=11&action=select_years (accessed December 2004).

Methodology The groundwater data are divided by population data and expressed in thousand cubic meters per capita.

Rationale Groundwater is an important part of the picture of a country's water resources. The more groundwater is available per capita, the higher the probability that a country can sustainably manage its groundwater resources, e.g. for agricultural production.

Indicator COALKM **Collection** ESI 2005

Indicator # 84 **Sub-Index**

Indicator Name Coal consumption per populated land area

Units Terajoules coal consumed per populated land area (at 5 or more persons per square km)

Reference Year 2001

Source For coal data: United States Energy Information Agency, http://www.eia.doe.gov/emeu/international/contents.html (accessed January 2005);
For populated land area data: Center for International Earth Science Information Network (CIESIN) Gridded Population of the World version 3 (GPW).
Additional or updated country data as follows. Taiwan: Ministry of Energy, http://www.moeaboe.gov.tw/07/handbook/92/p1.htm.

Methodology The original data are in billion British Thermal Units (BTUs), which were converted to terajoules. The factor applied to convert 10^9 BTUs to terajoules is 0.9478 (Source: Energy Information Administration). The Gridded Population of the World dataset (CIESIN) was used to calculate the total land area in each country inhabited with a population density of greater than 5 persons per km2.The data set was then used as the denominator for the coal consumption

Rationale Coal fired power plants emit higher SO2 levels and other air pollutants than natural gas or oil fired plants, and the energy produced is more carbon-intensive.

Indicator NOXKM **Collection** ESI 2005

Indicator # 85 **Sub-Index**

Indicator Name Anthropogenic NOx emissions per populated land area

Units Metric tons NOx emissions per populated land area (at 5 or more persons per square km)

Reference Year MRYA 1990-2003

Source For NOx emissions data: United Nations Framework Convention on Climate Change (UNFCCC)

Greenhouse Gas (GHG) emissions database, http://ghg.unfccc.int/default1.htf?time=10%3A43%3A50+PM (accessed April 2004), OECD Environmental Data Compendium 2002, Air and Climate, Emissions by Source, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html. (accessed October 2004), IPCC Special Report on Emissions Scenarios, Data Version 1.1 B1 Illustrative Marker Model with Model IMAGE with data for reference year 2000;
For Populated land area data: Gridded Population of the World Version 3, 2004, Center for International Earth Science Information Network (CIESIN). http://sedac.ciesin.columbia.edu/plue/gpw/index.html?main.html&2 (2004).
Additional and updated country data as follows. Austria: United Nations Economic and Social Council Economic Commission for Europe, Convention on Long-Range Transboundary Air Pollution (UNECE-CLRTAP) - Submission 2004, http://www.unece.org/env/lrtap/welcome.html. Belgium: Vlaamse Milieu Maatschappij - Flemish Environment Agency, Miet D'heer. Denmark: http://europa.eu.int/comm/eurostat/newcronos/reference/display.do?screen=welcomeref&open=/envir/milieu/air&language=en&product=EU_environment_energy&root=EU_environment_energy&scrollto=199. Estonia: http://pub.stat.ee/px-web.2001/I_Databas/Environment/01Environmental_pressure/02Air_pollution/02Air_pollution.asp. Ireland: Environmental Protection Agency. 2002. "Environment in Focus 2002 Key Environmental Indicators for Ireland", Editors M. Lehane, O. Le Bolloch and P. Crawley, County Wexford, Environmental Protection Agency. Jordan: Ministry of Energy and Mineral Resources, Table 8.3 Estimated Quantities of NOx Emission from the Energy Usage in Different Sectors, 1996-2003. Lithuania: Statistics Lithuania, http://www.std.lt or Eurostat's website http://europa.eu.int/comm/eurostat. Mauritius: Digest of Environment Statistics, 2003, Table 3.6. Slovak Republic: Slovak Hydrometeorological Institute, Slovak Hydrometeorological Institute and Ministry of Environment, "Air quality in the Slovak Republic 2001", http://oko.shmu.sk/rocenky/SHMU_Air_pollution_in_the_SR_2001.pdf, "Statistical yearbook of the Slovak Republic 2004" and "Environment in the Slovak Republic, Selected indicators in 1999 - 2003" to be published by Statistical Office of the Slovak Republic. Taiwan: Environmental Protection Administration (EPA), Air Quality Protection Division, Taiwan, Query results from TEDS 5.1 System, Statistics Office, Environmental Protection Administration, Taipei, Taiwan. United Kingdom: Department of Environment, http://www.defra.gov.uk/environment/statistics/airqual/download/xls/aqtb06.xls, http://www.defra.gov.uk/environment/statistics/airqual/aqnitrogen.htm (for explanation).

Methodology The data were merged as follows: UNFCCC data were available in Gigagrams for 1990, 1994, and 2000. The most recent year available was used for each country. The OECD data were available in thousand tonnes for 1980, 1985-2000 and the most recent year 1998-2000 was extracted. The OECD data were then used to fill gaps in the UNFCCC data. The resulting data set was transformed to metric tons per populated land area (km2).

Rationale NOx emissions contribute to changes in ambient air quality and consequently impact human and ecosystem health.

Indicator SO2KM **Collection** ESI 2005

Indicator # 86 **Sub-Index**

Indicator Name Anthropogenic SO2 emissions per populated land area

Units Metric tons SO2 per populated land area (at 5 or more persons per square km)

Reference Year MRYA 1990-2003

Source For SO2 emissions data: United Nations Framework Convention on Climate Change (UNFCCC) Greenhouse Gas (GHG) emissions database, http://ghg.unfccc.int/default1.htf?time=10%3A43%3A50+PM (accessed April 2004), OECD Environmental Data Compendium 2002, Air and Climate, Emissions by Source, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html. (accessed October 2004), IPCC Special Report on Emissions Scenarios, Data Version 1.1 B1 Illustrative Marker Model with Model IMAGE with data for reference year 2000;
For Populated land area data: Gridded Population of the World Version 3, 2004, Center for

International Earth Science Information Network (CIESIN). http://sedac.ciesin.columbia.edu/plue/gpw/index.html?main.html&2 (2004). Additional and updated country data as follows. Austria: United Nations Economic and Social Council Economic Commission for Europe, Convention on Long-Range Transboundary Air Pollution (UNECE-CLRTAP) - Submission 2004, http://www.unece.org/env/lrtap/welcome.html. Belgium: Vlaamse Milieu Maatschappij - Flemish Environment Agency (VMM), Miet D'heer. Ireland: Environmental Protection Agency. 2002. "Environment in Focus 2002 Key Environmental Indicators for Ireland", Editors M. Lehane, O. Le Bolloch and P. Crawley, County Wexford, Environmental Protection Agency. Mauritius: Central Statistics Office, Digest of Environment Statistics, 2003, Table 3.6. Slovak Republic: Slovak Republic: Slovak Hydrometeorological Institute, Slovak Hydrometeorological Institute and Ministry of Environment, "Air quality in the Slovak Republic 2001", http://oko.shmu.sk/rocenky/SHMU_Air_pollution_in_the_SR_2001.pdf, "Statistical yearbook of the Slovak Republic 2004" and "Environment in the Slovak Republic, Selected indicators in 1999 - 2003" to be published by Statistical Office of the Slovak Republic. Slovenia: Agencija Republike Slovenije za okolje (ARSO) - Environmental Agency of the Republic of Slovenia, "Kazalci okolja 2003" (Environmental Indicators), Editors Irena Rejec Brancelj, Urska Kusar Ljubljana, Slovenia, 2004, http://kazalci.arso.gov.si/. Taiwan: Query results from TEDS 5.1 System, Ms. Miou-Ru Huang, Statistics Office, Environmental Protection Administration, Taipei, Taiwan. Turkey: State Institution of Statistics, "Environmental Statistics Compendium of Turkey", January, 2003, published with MEDSTAT Programme financed by the European Union. United Kingdom: Department of Environment, http://www.defra.gov.uk/environment/statistics/airqual/download/xls/aqtb08.xls, http://www.defra.gov.uk/environment/statistics/airqual/aqsulphurd.htm (for explanation).

Methodology The data were merged as follows: UNFCCC data were available in Gigagrams for 1990, 1994, and 2000. The most recent year available was used for each country. The OECD data were available in thousand tonnes for 1980, 1985-2000 and the most recent available year 1997-2000 was extracted. The OECD data were then used to fill gaps in the UNFCCC data. The resulting data set was transformed to metric tons per populated land area (km2).

Rationale SO2 emissions contribute to changes in ambient air quality and consequently impact human and ecosystem health.

Indicator	VOCKM	**Collection**	ESI 2005
Indicator #	87	**Sub-Index**	

Indicator Name Anthropogenic VOC emissions per populated land area

Units Metric tons per populated land area (at 5 or more persons per square km)

Reference Year MRYA 1990-2003

Source For VOC emissions data: United Nations Framework Convention on Climate Change (UNFCCC) Greenhouse Gas (GHG) emissions database, http://ghg.unfccc.int/default1.htf?time=10%3A43%3A50+PM (accessed April 2004), OECD Environmental Data Compendium 2002, Air and Climate, Emissions by Source, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html. (accessed October 2004), IPCC Special Report on Emissions Scenarios, Data Version 1.1 B1 Illustrative Marker Model with Model IMAGE with data for reference year 2000;
For Populated land area data: Gridded Population of the World Version 3, 2004, Center for International Earth Science Information Network (CIESIN). http://sedac.ciesin.columbia.edu/plue/gpw/index.html?main.html&2 (2004).
Additional and updated data as follows. Austria: United Nations Economic and Social Council Economic Commission for Europe – Convention on Long-Range Transboundary Air Pollution (UNECE-CLRTAP) - Submission 2004, http://www.unece.org/env/lrtap/welcome.html. Belgium: Vlaamse Milieu Maatschappij - Flemish Environment Agency (VMM), Miet D'heer. Ireland: Environmental Protection Agency. 2002. "Environment in Focus 2002 Key Environmental

Indicators for Ireland", Editors M. Lehane, O. Le Bolloch and P. Crawley, County Wexford, Environmental Protection Agency. Jordan: Ministry of Energy and Mineral Resources, Table 8.5 Estimated Quatities of Non-Methane Volatile Organic Compound (NMVOC) Emission from the Energy Usage in Different Sectors, 1996-2003. Mauritius: Central Statistics Office, Digest of Environment Statistics, 2003, Table 3.6. Taiwan: Environmental Protection Administration (EPA), Taiwan, 2004, "Regulation operation plans of sectoral VOC pollutants from fixed sources", Mr. C. K. Yeh, Air Quality Protection Division, EPA. Turkey: State Institution of Statistics, "Environmental Statistics Compendium of Turkey", January, 2003, published with MEDSTAT Programme financed by the European Union. United Kingdom: Department of Environment, http://www.defra.gov.uk/environment/statistics/airqual/download/xls/aqtb16.xls, http://www.defra.gov.uk/environment/statistics/airqual/aqvoc.htm (for explanation).

Methodology The data were merged as follows: UNFCCC data were available for NMVOC (non-methane volatile organic compounds) emissions in Gigagrams for 1990, 1994, and 2000. The most recent year available was used for each country. The OECD data were available for VOC emissions in thousand tonnes for 1980, 1985-2000 and the most recent available year 1998-2000 was extracted. The OECD data were then used to fill gaps in the UNFCCC data. The resulting data set was transformed to metric tons per populated land area (km2). Emissions are from anthropogenic sources but UNFCCC data refer to NMVOC and the OECD data refer to VOC emissions, respectively.

Rationale VOC emissions contribute to changes in ambient air quality and consequently impact human and ecosystem health.

Indicator CARSKM **Collection** ESI 2005

Indicator # 88 **Sub-Index**

Indicator Name Vehicles in use per populated land area

Units Number of vehicles per populated land area (at 5 or more persons per square km)

Reference Year MRYA 1995-2004

Source For vehicles data: United Nations Statistics Division Common Database (UNCDB), http://unstats.un.org/unsd/cdb/cdb_help/cdb_quick_start.asp (accessed December 2004); For populated land area data: Center for International Earth Science Information Network (CIESIN) Gridded Population of the World version 3 (GPW).
Additional or updated country data as follows. Austria: Statistics Austria, Statistisches Jahrbuch Österreichs 2004 (Austrian Statistical Yearbook 2004), Table 28.04, Vienna 2003. Ireland: Environmental Protection Agency, "Environment in Focus 2002 Key Environmental Indicators for Ireland," Editors M. Lehane, O. Le Bolloch and P. Crawley, County Wexford. Italy: Automobil Club d'Italia, http://www.aci.it/wps/portal/.cmd/cs/.ce/155/.s/1104/_s.155/1104. Jordan: Jordan Traffic Department, Table 7.3 Number of Registered Vehicles by Type of Vehicle and Center of Registration, 2003. Lithuania: Statistics Lithuania, http://www.std.lt. Mauritius: Digest of Road Transport & Road Accident Statistics, 2003, Table 1.2. Philippines: Philippine Economic-Environmental and Natural Resources Accounting (PEENRA), http://www.nscb.gov.ph/peenra. Taiwan: Ministry of Transportation and Communication, http://www.motc.gov.tw/hypage.cgi?HYPAGE=stat01.asp. United Arab Emirates: Ministry of Interior, Annual Statistical Report. Zimbabwe: Central Statistical Office, Motor Vehicle Report.

Methodology The Gridded Population of the World dataset (CIESIN) was used to calculate the total land area in each country inhabited with a population density of greater than 5 persons per square km. This data set was then used as the denominator for the vehicles data, which includes registered cars, trucks and buses but not motorcycles.

Rationale This is a proxy measure of air pollution from the transportation sector, which is a large sector in terms of energy use and experiences the highest growth rates.

Indicator	FOREST	**Collection**	ESI 2005
Indicator #	89	**Sub-Index**	

Indicator Name Annual average forest cover change rate from 1990 to 2000

Units Average annual change rate in forest cover from 1990 to 2000

Reference Year 1990 to 2000

Source United Nations Food and Agriculture Organization (FAO) Forest resources assessment (FRA) 2000, http://www.fao.org/forestry/fo/fra/index.jsp (accessed December 2004).

Methodology For area statistics, FRA 2000 generated information at three scales - country (based on surveys of national inventory and mapping reports), region (FRA 2000 remote sensing survey) and world (FRA 2000 global mapping). For the estimates of area and area change, only country- and regional-level information was used, as the global forest map did not provide sufficient precision.See briefing paper by Emily Matthews (WRI, Forest Briefing No.1, March 2001). For discussion of methodological problems and other issues with this FAO effort.

Rationale When forests are lost or severely degraded, their capacity to function as regulators for the environment is also lost, increasing flood and erosion hazards, reducing soil fertility, and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

Indicator	ACEXC	**Collection**	ESI 2005
Indicator #	90	**Sub-Index**	

Indicator Name Acidification exceedance from anthropogenic sulfur deposition

Units Percentage of total land area at risk of acidification exceedance

Reference Year 1990

Source Stockholm Environment Institute at York, Acidification in Developing Countries: Ecosystem Sensitivity and the Critical Loads Approach at the Global Scale, 2000, available in pdf at http://www.york.ac.uk/inst/sei/pubs/globalassess.pdf (accessed January 2005).

Methodology From a map of acidification exceedance, the area of terrestrial ecosystems at risk were summed within each country and then the percentage of a country at risk of exceedance was calculated.

Rationale Exceedance of critical SO2 loading represents an indicator for ecosystems under stress due to acidification from anthropogenic sulfur deposition. Since it takes into account both the deposition and the ability of the ecosystem to respond to stress, it is a good indicator of the ecosystems' sustainability.

Indicator	GR2050	**Collection**	ESI 2005
Indicator #	91	**Sub-Index**	

Indicator Name Percentage change in projected population 2004-2050

Units Percentage change in projected population 2004-2050

Reference Year 2004

Source Population Reference Bureau (PRB). 2004 World Population Data Sheet. http://www.prb.org/datafind/datafinder5.htm (accessed December 2004).

Methodology The projected population in 2050 was divided by the population in 2004 to calculate a percentage change in the population between the two dates.

Rationale The projected change in population between 2004 and 2050 provides an indication of the trajectory of population change, which has an impact on a country's per capita natural resource availability and environmental conditions. Projections can be made with a fair degree of accuracy because of the influence of a country's current age structure and fertility on likely future growth.

Indicator TFR **Collection** ESI 2005

Indicator # 92 **Sub-Index**

Indicator Name Total Fertility Rate

Units Average number of births per woman based on current age-specific fertility rates

Reference Year 2004

Source Population Reference Bureau (PRB), 2004 World Population Data Sheet, http://www.prb.org/datafind/datafinder5.htm (accessed January 2005).

Methodology The average number of children a woman will have, assuming that current age-specific birth rates remain constant throughout her childbearing years (usually considered to be ages 15 to 49).

Rationale Fertility contributes significantly to population growth, and thus to pressures on natural resources.

Indicator EFPC **Collection** ESI 2005

Indicator # 93 **Sub-Index**

Indicator Name Ecological Footprint per capita

Units Hectares of biologically productive land required per capita

Reference Year MRYA 1999-2000

Source Redefining Progress Ecological Footprint of Nations 2004, http://www.redefiningprogress.org/newpubs/index.shtml (accessed January 2005). Additional country data as follows. Afghanistan, Niger, Somalia, Togo, Uzbekistan, Yemen: The World Wildlife Fund (WWF), Living Planet Report 2002, http://www.wwf.org.uk/filelibrary/pdf/livingplanet2002.pdf (accessed January 2005). Additional sources: Taiwan: Lee, Y.J. and A.C. Chen. 1998. Examining sustainable development of Taiwan in terms of ecological footprints. Review in Economic and Social Institutions, 22, pp. 437-458, published in Chinese by the Council for Economic Planning and Development, Taiwan, http://www.cepd.gov.tw/english/.

Methodology For a full methodology of the ecological footprint calculations, please see the original source data set documentation. The data reflect information from the Ecological Footprint of Nations 2004. The reference year is 2000. For Niger, Somalia, Togo, Afghanistan, Uzbekistan, and Yemen, the 1999 data from the Living Planet Report 2002 were used.

Rationale The ecological footprint is a measure of the biologically productive land that is required to sustain a country's population at current consumption levels. Countries whose footprints exceed their own arable land area are consuming at levels that are unsustainable in the long term.

Indicator	RECYCLE	**Collection**	ESI 2005
Indicator #	94	**Sub-Index**	

Indicator Name Waste recycling rates

Units Percentage of solid waste recycled for 1998 for selected cities in each country for non-OECD countries and the percentage of glass, paper and cardboard recycled for OECD countries

Reference Year MRYA 1996-2003

Source Organisation for Economic Co-operation and Development (OECD) Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_1_1_1_37465,00.html (accessed October 2004), and United Nations Human Settlement Programme (UNHABITAT) Global Urban Indicators Database 1998, http://www.unhabitat.org/programmes/guo/guo_indicators.asp (accessed December 2003). Additional and updated country data as follows. Taiwan: Environmental Protection Administration (EPA), Taiwan, http://210.69.101.88/WEBSTATIS/webindex.htm.

Methodology If both recycling rates were available for an OECD country, the maximum of the recycling rates for glass and "paper and cardboard" was used. If neither value was available, it was classified as missing. The solid waste recycling data refer to municipal waste, waste handled by the scrapping industry and other waste from economic activities. Material that is collected for recycling by private sources is included. Internal recycling, i.e. within industrial establishments, is excluded. Recycling is defined as any reuse of material in a production process that diverts it from the waste stream, except reuse as fuel. Reprocessing as the same type of product, and for different purpose, are both included. "Recycling rates" are the ratios of the quantity collected for recycling to the apparent consumption (economic notion of domestic production of the respective material + imports - exports). Definitions may vary from

Rationale Waste recycling reduces the impact on the environment by using resources more efficiently and by reducing the stream of waste for landfills and incineration.

Indicator	HAZWST	**Collection**	ESI 2005
Indicator #	95	**Sub-Index**	

Indicator Name Generation of hazardous waste

Units Metric tons of hazardous waste to be managed in the country

Reference Year MRYA 1992-2001

Source United Nations Environment Program, Secretariat of the Basel Convention for 1992-2000 data, "Global Trends in Generation and Transboundary Movements of Hazardous Wastes and Other wastes", Appendix 4, http://www.basel.int/natreporting/trends2.pdf (accessed November 2004), Secretariat of the Basel Convention, Data as Reported by Parties, http://geodata.grid.unep.ch for 2001 (accessed November 2004), Organisation for Economic Co-operation and Development (OECD) Environmental Data Compendium 2002, http://www.oecd.org/document/21/0,2340,en_2649_37465_2516565_119656_1_1_37465,00.html (accessed July 2004).
Additional and updated country data as follows. Austria: Umweltbundesamt (Federal Environment Agency), http://www.umweltbundesamt.at. Estonia: Statistical Office of Estonia, http://pub.stat.ee/px-web.2001/I_Databas/Environment/01Environmental_pressure/06Generation_of_waste/06Generation_of_waste.asp. Lithuania: Ministry of Environment of the Republic of Lithuania, "State of Environment 2002", http://www.am.lt. Poland: National Fund for Environmental Protection and Water Management by order of the Polish Minister of Environment, “Environmental Statistics in Poland 2004”, Environmental Inspection Data. Slovenia: Agencija Republike Slovenije za okolje (ARSO) - Environmental Agency of the Republic of Slovenia, "Kazalci okolja 2003"

(Environmental Indicators), Editors Irena Rejec Brancelj, Urška Kušar Ljubljana, Slovenia, 2004, http://kazalci.arso.gov.si/. Taiwan: Industrial Waste Management Center, Environmental Protection Agency, Taiwan, http://waste.epa.gov.tw/prog/statistics_file/country_wide_waste/waste_wallchart_0412_s.files/sheet002.htm, Declaration Website for Hazardous and Non-hazardous Wastes, http://waste.epa.gov.tw/prog/unit5.htm.Turkey: Turkey State Institute of Statistics, sent to EUROSTAT by OECD/EUROSTAT joint questionnaires, 2004. United Arab Emirates: Federal Environment Agency, Annual Report 2003, Abu Dhabi National Oil Company (ADNOC), Environmental Research and Wildlife Development Agency (ERWDA), "Hazardous Waste Generation".

Methodology The data from the Basel Convention on the amounts of hazardous waste to be managed in the country (thousand tonnes) have been extended by OECD data for the following countries: USA, Japan, and New Zealand. The methodologies underlying both data sources may not be fully comparable although both source refer to "amounts to be managed in the country" (a comparison of OECD data and Basel Convention data for countries reporting to both sources indicates that substantial differences can exist). The objective lies therefore in increasing geographical coverage rather than complete comparability of the data. All Basel data refer to the year 2000, the additional 5 OECD values refer to years between 1992 and 1999. Also note a potential rounding bias due to the fact that the OECD data are reported in thousand metric tons while the Basel data are in metric tons.

Rationale Most countries in the world are confronting real difficulties in safely disposing of their hazardous wastes. The more hazardous waste generated, the less likely that a long-term sustainable solution can be found for their proper disposal.

Indicator BODWAT **Collection** ESI 2005

Indicator # 96 **Sub-Index**

Indicator Name Industrial organic water pollutant (BOD) emissions per available freshwater

Units Metric tons of daily BOD emissions per cubic km of available freshwater

Reference Year BOD: MRYA 1990-2000; Population: 1995; Freshwater availability: long-term average 1961-1995

Source For BOD emissions data: World Bank Development Indicators 2004, http://www.worldbank.org/data/wdi2004/;
For water availability data: Center for Environmental Systems Research, University of Kassel, WATERGAP version 2.1 (communication);
For population data: World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed December 2004).
Additional or updated country data as follows: Taiwan: Environmental Protection Administration (EPA), Taiwan, Statistical Manual for Environmental Protection, Table 3-6, September 2004. http://phlip.epa.gov.tw/gaiscgi/getfilelist.exe?no=-6&filelist=..\tmp\queE9C6.tmp&page=0&markup=1.

Methodology Emissions of organic water pollutants were measured by biochemical oxygen demand, which is the amount of oxygen that bacteria in the water will consume in breaking down waste. This is a standard water-treatment test for the presence of organic pollutants. The data from the World Bank, which represent daily BOD emissions in kilograms, were normalized by water availability from the WaterGap version 2.1B model (Kassel University).

Rationale Emissions of organic pollutants from industrial activities degrade water quality by contributing to the eutrophication of water bodies. Given these considerations, the biochemical oxygen demand (BOD) emissions have been normalized per amount of freshwater available (internal water availability + inflows from other countries).

Indicator	FERTHA	**Collection**	ESI 2005
Indicator #	97	**Sub-Index**	

Indicator Name Fertilizer consumption per hectare of arable land

Units 100 grams fertilizer per hectare of arable land

Reference Year MRYA 2001-2003

Source World Bank World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed December 2004).
Additional or updated country data as follows. Austria: Federal Ministry of Agriculture, Forestry, Environment and Water Management, "Grüner Bericht 2004" (Green Report 2004, report on the situation of the Austrian agriculture and forestry in 2003), page 198, table 4.8; http://www.gruener-bericht.at/2004/components/com_docman/dl2.php?archive=0&file=MTYxX3RhYmVsbGVudGVpbF9taXRfaW5oYWx0c3ZlcnplaWNobmlzLnBkZg== (page 38 of 112). Belgium: Institut National de Statistiques - National Institute of Statistics (INS), http://statbel.fgov.be. Ireland: Environmental Protections Agency, "Environment in Focus 2002: Key Environmental Indicators for Ireland, Editors M Lehane, O Le Bolloch and P Crawley, County Wexford, Ireland, www.epa.ie. Mauritius: Central Statistics Office, data on consumption of fertilizers and utilization of agricultural area, Digest of Environment Statistics, 2003, Table 5.6 and 5.2 respectively. Slovak Republic: For Fertilizer data, Statistical Office of Slovak Republic, For Land Use data, Office of Geodesy, Cartography and Land register of the Slovak Republic. Published in "Statistical yearbook of the Slovak Republic 2003" and "Environment in the Slovak Republic (Selected indicators in 1998 - 2002)" by Statistical Office of the Slovak Republic. Taiwan: The Agricultural Council, Taiwan, Fertilizer consumption, http://www.coa.gov.tw/file/10/195/207/1162/328.xls, Farming area, http://www.coa.gov.tw/file/10/195/207/1162/285.xls. United Arab Emirates: Ministry of Agriculture and Fisheries, Annual Reports 2002 and 2003.

Methodology Fertilizer consumption (100 grams per hectare of arable land) measures the quantity of plant nutrients used per unit of arable land. Fertilizer products cover nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate). The time reference for fertilizer consumption is the crop year (July through June). Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Original source: Food and Agriculture Organization, Production Yearbook and data files.

Rationale Excessive use of fertilizers from agricultural activities has a negative impact on soil and water, altering chemistry and levels of nutrients and leading to eutrophication of water bodies.

Indicator	PESTHA	**Collection**	ESI 2005
Indicator #	98	**Sub-Index**	

Indicator Name Pesticide consumption per hectare of arable land

Units Kilograms pesticide consumption per hectares of arable land

Reference Year MRYA 1990-2003

Source Food and Agricultural Organisation (FAO), United Nations, FAOSTAT online database accessed from World Resources Institute (WRI) Earthtrends 2004, Agriculture and Food - Agricultural Inputs, http://earthtrends.wri.org/searchable_db/index.cfm?theme=8 (accessed December 2004).
Additional and updated country data as follows. Albania: Ministry of Environment, Albania. Austria: Federal Ministry of Agriculture, Forestry, Environment and Water Management, "Grüner Bericht 2004" (Green Report 2004, report on the situation of the Austrian agriculture

and forestry in 2003, page 198, table 4.6, Vienna 2004, http://www.gruener-bericht.at/2004/components/com_docman/dl2.php?archive=0&file=MTYxX3RhYmVsbGVudGVpbF9taXRfaW5oYWx0c3ZlcnplaWNobmlzLnBkZg== (page 37 of 112). Belgium: CEEW - DGRNE (Cellule Etat de l'environnement wallon - Direction générale des ressources naturelles et de l'environnement, Walloon State of the Environment Cell - Directorate-General for Natural Resources and the Environment), V. Brahy, Report by the Ministère des classes moyennes et de l'agriculture (Ministry of Small Enterprises, Traders and Agriculture), "Use of phytopharmaceutical products in the main crops in Belgium during the decade 1991 – 2000". http://statbel.fgov.be. Italy: Istituto Nazionale di Statistica (Istat, National Institute of Statistics), Statistiche dell'agricoltura, vari anni, and Istat, Statistiche Ambientali, Annuario n. 7, 2002, http://istat.it/, http://catalogo.istat.it/20031029_01/. Republic of Korea: Food and Agriculture Organization of the United Nations (FAO), 2004, FAOSTAT on-line statistical service, Rome, http://apps.fao.org. Mauritius: Central Statistics Office, Digest of Environment Statistics, 2003 (Table 5.5). Poland: Polish Ministry of the Environment, "Environmental Statistics in Poland 2004", pg 30. Slovak Republic: Pesticide usage data: Ministry of Agriculture of the Slovak Republic, Central Control and Testing Institute of the Slovak Republic, Land Use data: Office of Geodesy, Cartography and Land register of the Slovak Republic. To be published in "Statistical yearbook of the Slovak Republic 2004" and "Environment in the Slovak Republic, Selected indicators in 1999 - 2003" by Statistical Office of the Slovak Republic. Slovenia: Statistical Office of the Republic of Slovenia, Statistical Yearbook, http://www.stat.si/letopis/index_vsebina.asp?poglavje=16&leto=2003&jezik=en. Taiwan: The Agricultural Council, Taiwan, Pesticide consumption data, http://www.coa.gov.tw/program/pesticides/statistic/statistic.htm, Farming area data, http://www.coa.gov.tw/8/195/202/894/894.html. United Arab Emirates: Ministry of Agriculture and Fisheries, Annual Reports 2002 and 2003.

Methodology Pesticide use intensity refers to the amount of pesticide used per hectare of arable and permanent cropland. To calculate this figure, total pesticide consumption in agriculture is divided by the total area of arable and permanent cropland. Pesticide consumption is measured in metric tons of active ingredients. Pesticides are organized into eight categories, the sum of which is used to determine total pesticide consumption. The eight categories are: insecticides, mineral oils, herbicides, fungicides and bactericides, seed treatment - fungicides, seed treatment - insecticides, plant growth regulators and rodenticides. Arable and permanent cropland is comprised of both arable and permanent land in a given country for each year. Arable land is land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens, and land temporarily fallow (less than five years). The abandoned land resulting from shifting cultivation is not included in this category. Data for "Arable land" are not meant to indicate the amount of land that is potentially cultivable. Permanent Crops is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee and rubber; this category includes land under flowering shrubs, fruit trees, nut trees and vines, but excludes land under trees grown for wood or timber.

Rationale Excessive use of pesticides in agricultural activities has negative impacts on soil, water, humans and wildlife.

Indicator WATSTR **Collection** ESI 2005

Indicator # 99 **Sub-Index**

Indicator Name Percentage of country under severe water stress

Units Percentage of national territory in which water consumption exceeds 40 percent of available water

Reference Year 1961-1995 (long-term average)

Source Center for Environmental Systems Research, University of Kassel, WaterGap 2.1, 2000 (communication).

Methodology These data are derived from the WaterGap 2.1 gridded hydrological model developed by the Center for Environmental Systems Research, University of Kassel, Germany. The modelers derived gridcell by gridcell estimates of where water consumption exceeded 40 percent of the water available in that particular grid cell. These were then converted to land area equivalents, and the percent of the territory under severe water stress was calculated.

Rationale The regional distribution of water availability relative to population and consumption needs is as important as its overall water availability. This variable captures the percent of the territory that is under water stress, which will affect the availability of water for environmental services and human well-being.

Indicator OVRFSH **Collection** ESI 2005

Indicator # 100 **Sub-Index**

Indicator Name Productivity overfishing

Units Score between 1 and 7 with high scores corresponding to high degrees of overfishing

Reference Year Average for 1993-1998

Source South Pacific Applied Geoscience Commission (SOPAC), Environmental Vulnerability Index, Indicator 34 -- Productivity overfishing.
For Fisheries data: Food and Agriculture Organization (FAO), United Nations, 1993-1998,
For Productivity data: University of British Columbia.

Methodology This measure is drawn from the EVI prepared by SOPAC in partnership with UNEP and other support. The indicator's cut-off values are based on the ratio of fisheries productivity to fish catch, or specifically the ratio of tonnes of carbon per square kilometer of exclusive economic zone per year to tonnes of fish catch per square kilometer of shelf per year. The score ranges represent the following: 1=(>=3.2millions], 2=(3.2-1.2 millions], 3=(1.2 millions - 442 thousand], 4=(442-163 thousand] ,5=(163-60 thousand], 6=(60-22 thousand], 7=(<=22 thousand].

Rationale Fish stocks are an important component of marine ecosystems. Overfishing puts pressure on ecosystems and threatens biodiversity.

Indicator FORCERT **Collection** ESI 2005

Indicator # 101 **Sub-Index**

Indicator Name Percentage of total forest area that is certified for sustainable management

Units Percentage of total forest area that is FSC or PEFC certified

Reference Year Certifications: 2004, Total forest area: 2000

Source For certifications: The Forest Stewardship Council, URL: http://www.fsc.org/fsc/whats_new/documents/Docs_cent/4 (accessed December 2004) for FSC certified forest area and the Pan-European Forest Certification Council, http://www.pefc.cz/register/statistics.asp (accessed December 2004); For Total forest area: World Resources Institute for Total Forest Area, URL: http://earthtrends.wri.org/searchable_db/index.cfm?theme=9&variable_ID=296&action=select_countries (accessed January 2005).

Methodology The forest area certified by either the Forest Stewardship Council (FSC) or the Pan-European Forest Certification Council (PEFC) is divided by the year 2000 total forest area. To avoid double counting, if a country has forest areas under both programs, the maximum is selected. If no data are available for FSC or PEFC certified forest area, the value is set to 0. Also, ratios exceeding 100% are set to 100. This is the case for Croatia, Liechtenstein, Finland, and Norway.

Rationale This variable measures the extent to which a country seeks sustainable forestry practices.

Indicator	WEFSUB	**Collection**	ESI 2005
Indicator #	102	**Sub-Index**	

Indicator Name World Economic Forum Survey on subsidies

Units Survey Responses Ranging from 1 (strongly disagree) to 7 (strongly agree)

Reference Year 2003/4

Source World Economic Forum (WEF) Survey, The Global Competitiveness Report 2003-2004, Porter, Michael E. et al, Oxford University Press, 2003-2004, http://www.weforum.org/site/knowledgenavigator.nsf/Content/KB+Country+Profiles (accessed January 2005).

Methodology Response to the statement "No government subsidies for energy or materials usage are present."

Rationale Subsidies encourage wasteful consumption of energy and materials.

Indicator	IRRSAL	**Collection**	ESI 2005
Indicator #	103	**Sub-Index**	

Indicator Name Salinized area due to irrigation as percentage of total arable land

Units Percentage of total arable land salinized due to irrigation

Reference Year Arable land: 2000, Salinized area: MRYA 1990-1999

Source United Nations Food and Agricultural Organization (FAO), http://www.fao.org/ and also http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/Y4263E/y4263e04.htm (accessed January 2005).

Methodology The area of land salinized due to irrigation is divided by the total arable land area for each country (benchmarked to 2000).

Rationale Soil salinization is a form of land degradation. The transport of salts to the land's surface due to irrigation renders the land unfit for production, and is therefore unsustainable in the long run.

Indicator	AGSUB	**Collection**	ESI 2005
Indicator #	104	**Sub-Index**	

Indicator Name Agricultural subsidies

Units Scale from 1 (lowest) to 8 (highest), with 0 being missing data

Reference Year PSE and AMS: MRYA 1997-2001, EU15: 2001, Aricultural GDP: MRYA 1992-2001

Source For producer support estimates (PSE) data: Organisation for Economic Co-operation and Development (OECD); OECD Producer Support Estimates for 2001 as a percentage of agricultural GDP and data for China and India were provided by John Finn (World Trade

Organization); For share of agricultural production of EU15 of total EU agricultural production: European Commission, Directorate General Agriculture, Agricultural Situation in the EU 2003; For currency exchange rates data: World Bank, World Development Indicators (WDI) 2004, http://www.worldbank.org/data/wdi2004/ (accessed December 2004); For conversion of ECU into USD: http://www.x-rates.com/d/USD/EUR/hist1999 (accessed December 2004).

Methodology The OECD data measure producer support estimates (PSE), the WTO data refer to aggregate measure of support (AMS). The WTO data were converted from national currencies to US dollars using annual average exchange rates for the year 1999 as follows: For conversion of ECU to USD, the historic weighted 12 month average was calculated using data from http://www.x-rates.com/d/USD/EUR/hist1999.html, the remaining national currencies were converted using annual average exchange rates from the World Bank WDI 2004. OECD data for the European Union of 15 member states refer to total PSE for the 15 members. A breakdown by member state was calculated as follows: The total PSE for EU15 was multiplied by each country's fraction of total EU15 agricultural production, assuming that PSE's correlate with the total value of a country's agricultural production. OECD countries, for which John Finn (WTO) provided updated PSE data as percentage of total agricultural GDP replaced older OECD data. The final data were then classified into 8 groups as follows: [0-10%)=1; [10-20%)=2; [20-30%)=3, [30-40%)=4, [40-50%)=5, [50-60%)=6, [60-70%)=7, [>70%)=8. For China and India the data were taken from their notifications to the WTO. All other countries with no information are classified as 0.

Rationale Agricultural subsidies reduce environmental sustainability primarily by creating price distortions, promoting the production of input intensive crops, wasteful use of natural resource inputs, use of marginal and fragile lands, and rent-seeking behavior.

Indicator DISINT **Collection** ESI 2005

Indicator # 105 **Sub-Index**

Indicator Name Death rate from intestinal infectious diseases

Units Deaths per 100,000 population

Reference Year MRYA 1995-2002

Source World Health Organization (WHO), Mortality databases for International Classification of Deaths (ICD) revisions 9 and 10, July 200http://www3.who.int/whosis/menu.cfm?path=mort (accessed January 2005).

Methodology Standardized, age-specific death rate from intestinal infectious diseases. Results calculated as follows: For ICD-9, the codes extracted are B01 and CH01 (which cover B01-B07 in ICD-9) for Armenia, Belarus, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and the former USSR (for some years), and C004-C006 for China (which cover 001-005, 008, and 009 in the detailed ICD-9). For ICD-10 the codes extracted are A00, A03-A09, and A010. The data were extracted by age group and aggregated by sex. They were then combined with annual population data by age group prepared by CIESIN for the year 2000. The data were then standardized for differences in the national age distributions using Canada's population structure in 2000 as it offers a relatively stable and suitable reference distribution. WHO code BO1 for ICD-9 includes cholera, typhoid fever, shigellosis, food poisoning, amoebiasis, intestinal infections due to other specified organism, ill-defined intestinal infections, and other. For ICD-10 the codes that most closely match B01 are typhoid fever (A010), cholera (A00), shigellosis (A03), other bacterial intestinal infections (A04), other bacterial food-borne intoxications (A05), amoebiasis (A06), other protozoal intestinal diseases (A07), viral and other specified intestinal infections (A08), and diarrhea and gastroenteritis of presumed infectious origin (A09). The codes for China and former USSR republics for the ICD-9 classifications are: typhoid and paratyphoid fevers (C004), shigellosis (C005), and other intestinal infectious diseases (C006); and infectious and parasitic diseases (CH01).

Rationale Indicator of the degree to which the population is affected by poor sanitation and water quality, which are related to environmental conditions.

Indicator DISRES **Collection** ESI 2005

Indicator # 106 **Sub-Index**

Indicator Name Child death rate from respiratory diseases

Units Deaths per 100,000 population aged 0-14

Reference Year MRYA 1995-2002

Source World Health Organization (WHO), Mortality databases for International Classification of Deaths (ICD) revisions 9 and 10, July 2004, http://www3.who.int/whosis/menu.cfm?path=mort (accessed January 2005).

Methodology The final results were calculated as follows: For ICD-9, the codes extracted are B31, B320, B321, CH08 (which covers B31 and B32 in ICD-9), S310 (which covers B310-B312, B320 in ICD-9) for Armenia, Belarus, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and the former USSR (for some years), and C052 and C053 for China (which cover 460-519 and 480-486 in the detailed ICD-9). For ICD-10 the codes extracted are J03, J04, J06, J311, J312, J32, J33, J342, J35, J20, J21, J12-J16, and J18. The data were extracted by age group (0-14 years) and aggregated by sex. They were then combined with annual population data by age group prepared by CIESIN for the year 2000. WHO code B31 for ICD-9 includes acute tonsilitis, acute laryngitis and tracheitis, other acute upper respiratory infections, deflected nasal septum and nasal polyps, chronic pharyngitis, nasopharyngitis and sinusitus, chronic diseases of tonsils and adenoids, and other. The WHO code B320 for ICD-9 includes acute bronchitis and bronchiolitis. The WHO code B321 for ICD-9 includes pneumonia. For ICD-10 the codes that most closely match B31 are acute tonsillitis (J03), acute laryngitis and tracheitis (J04), acute upper respiratory infections of multiple and unspecified sites (J06), chronic pharyngitis (J312), chrinic nasopharyngitis (J311), chronic sinusitis (J32), nasal polyps (J33), deviated nasal septum (J342), chronic diseases of the tonsils and adenoids (J35). The Who codes for ICD-10 that most closely match B320 are acute bronchitis (J20) and acute bronchiolitis (J21). The WHO codes for ICD-10 that most closely match B321 are viral pneumonia n.e.s. (J12), pneumonia due to streptococcus pneumoniae (J13), pneumonia due to haemophilus influenzae (J14), bacterial pneumonia n.e.s. (J15), pneumonia due to other infectious organisms n.e.s. (J16), pneumonia, organism unspecified (J18). The codes for China and the former USSR republics for ICD-9 are disease of the respiratory system (C052) and pneumonia (C053); and diseases of the respiratory system (CH08) and acute respiratory diseases (S310).

Rationale Indicator of the degree to which children are impacted by poor air quality.

Indicator U5MORT **Collection** ESI 2005

Indicator # 107 **Sub-Index**

Indicator Name Children under five mortality rate per 1,000 live births

Units Children under five mortality rate per 1,000 live births

Reference Year MRYA 2002-2004

Source United Nations Statistics Division (UNSD), Demographic Yearbook Database, primary data source was UNICEF, http://unstats.un.org/unsd/demographic/default.htm (accessed January 2005).
Additional and updated data as follows. Australia: Australian Bureau of Statistics, Births, Australia 2002 (cat. No. 3301.0), Deaths, Australia (cat. No. 3302.0). Austria: Statistics

Austria. Costa Rica: Instituto Nacional de Estadística y Censos 2004, "Estadísticas Vitales del 2003", based on CIE-10 (Clasificación Internacional de Enfermedades y Problemas Relacionados con la Salud, X revisión, volumen I, Organización Panamericana de la Salud y Organización Mundial de la Salud, http//www.inec.go.cr. Lithuania: Statistics Lithuania, Eurostat. Mauritius: Ministry of Public Utilities, Statistics Unit. New Zealand: Statistics New Zealand, http://www.stats.govt.nz/datasets/a-z-list.htm. Poland: Central Statistical Office Dissemination information, Polish Census 2002. Taiwan: Department of Health, http://www.doh.gov.tw/statistic/data/生命統計/91/10.XLS, Table 10.Number of deaths classified according to the basic tabulation list of death by sex and age, Taiwan Area, 2002, Age Composition of Population, Taiwan Area, http://www.doh.gov.tw/statistic/data/生命統計/91/02.XLS. United Arab Emirates: Ministry of Health, Annual Statistical Report, 2003 and Annual Report of Preventive Medicine, 2003.

Methodology Deaths between birth and age five divided by live births (in thousands).

Rationale Under-5 mortality rate is a measure of the vulnerability of the most vulnerable population group.

Indicator	UND_NO	**Collection**	ESI 2005
Indicator #	108	**Sub-Index**	

Indicator Name Percentage of undernourished in total population

Units Percentage of undernourished in total population

Reference Year MRYA 1999-2001

Source United Nations Food and Agriculture Organization (FAO), The State of Food Insecurity in the World 2003 Report, http://www.fao.org/docrep/006/j0083e/j0083e00.htm (accessed January 2005).

Methodology The value of 1% was allocated to the following countries: Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Iceland, Israel, Italy, Japan, South Korea, The Netherlands, Norway, New Zealand, Portugal, Sweden, and the United States of America. These countries are not covered in the FAO State of Food Insecurity in the World 2003 report but are considered to have a small proportion of undernourished people.

Rationale This indicator represents the population vulnerability to malnutrition, famine or diseases, in addition to showing the incapacity of an economy to supply an adequate amount of food and to manage food resources.

Indicator	WATSUP	**Collection**	ESI 2005
Indicator #	109	**Sub-Index**	

Indicator Name Percentage of population with access to improved drinking water source

Units Percentage of population with access to improved drinking water source

Reference Year MRYA 1991-2004

Source World Health Organization, United Nations Children's Fund, WHO/UNICEF Joint Monitoring Programme on Water Supply and Sanitation (JMP), http://www.who.int/water_sanitation_health/monitoring/jmp2004/en/ (accessed January 2005).
Additional and updated data as follows. Belgium: Institut National de Statistiques - National Institute of Statistics (INS), http://statbel.fgov.be, officially reported to Eurostat in 2003. Ireland:

Central Statistics Office, Social Statistics Integration, Dublin. Italy: Istituto Nazionale di Statistica (Istat - National Institute of Statistics) , "13° Censimento Generale della Popolazione, 1991". Taiwan: United Nations Statistical Division, http://unstats.un.org/unsd/mi/mi_goals.asp. United

Methodology Proportion of population with sustainable access to an improved water source, whole Area (UNICEF-WHO)

Rationale The percentage of population with access to improved sources of drinking water supply is directly related to the capacity of a country to provide a healthy environment, reducing the risks associated with water-borne diseases and exposure to pollutants.

Indicator DISCAS **Collection** ESI 2005

Indicator # 110 **Sub-Index**

Indicator Name Average number of deaths per million inhabitants from floods, tropical cyclones, and droughts

Units Average number of deaths per million inhabitants

Reference Year 1980-2000

Source United Nations Development Programme (UNDP) Bureau for Crisis Prevention and Recovery, A Global Report on Reducing Disaster Risk - A Challenge for Development, UNDP 2004, available at http://www.undp.org/bcpr/disred/rdr.htm (accessed January 2005).

Methodology The UNDP compiled these measures by aggregating and normalizing information from the OFDA/CRED International Disasters Data Base, Center for Research on the Epidemiology of Disasters.

Rationale Vulnerability to natural disasters is a function of the exposure to hazards (how often and how severe they are), the sensitivity to such hazards (how big the linkages are to social systems), and the resilience within a society to hazard impacts. By averaging deaths from environmentally-related natural disasters, this measure provides a useful summary of overall human vulnerability to environmental change.

Indicator DISEXP **Collection** ESI 2005

Indicator # 111 **Sub-Index**

Indicator Name Environmental Hazard Exposure Index

Units An index of population-weighted exposure to high levels of environmentally-related natural hazards.

Reference Year 2005

Source The World Bank, Natural Disaster Hotspots: A Global Risk Analysis, Maxx Dilley, Robert Chen, Uwe Deichmann, Arthur L. Lerner-Lam and Margaret Arnold with Jonathan Agwe, Piet Buys, Oddvar Kjekstad, Bradfield Lyon and Greg Yetman, 2005, Washington DC, see also http://iri.columbia.edu/impact/project/RiskHotspot/ (accessed January 2005).

Methodology To calculate the environmental hazard exposure index, data from Dilley et al. were used. Data on exposure to landslides, droughts, cyclones and floods were put into a consistent GIS database. The world's land area was classified into degrees of exposure to these four hazards. Those grid cells falling into the highest three deciles of exposure were flagged. The number of high-exposure hazards was summed for each grid cell. The values range from 0-4. The resulting gridded data set was then overlaid with a gridded population data set for the year 2000. Each person was assigned a score equal to the number of high-exposure hazards identified in that grid cell. We calculated the sum of personal exposure scores, and divided by

the total population, by country. The theoretically possible range was 0-4. The actual index ranged from 0 to 2.04.

Rationale Vulnerability to natural disasters is a function of the exposure to hazards (how often and how severe they are), the sensitivity to such hazards (how big the linkages are to social systems), and the resilience within a society to hazard impacts. This measure provides a useful proxy of the exposure term.

Indicator	GASPR	**Collection**	ESI 2005
Indicator #	112	**Sub-Index**	
Indicator Name	Ratio of gasoline price to world average		
Units	Ratio of gasoline price to world average price		
Reference Year	2002		
Source	World Bank, World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/. Additional and updated country data as follows: Mauritius: Digest of Road Transport & Road Accident Statistics, 2003, Table 3.1. Taiwan: US Energy Information Administration (EIA), http://www.eia.doe.gov/emeu/international/petroleu.html#GasolinePrices.		
Methodology	Pump price for super gasoline (US dollars per liter): Fuel prices refer to the pump prices of the most widely sold grade of gasoline expressed in US dollars. The ratio of the gas price to the world average in the same time period was used to normalize the data.		
Rationale	Unsubsidized gasoline prices are an indicator that appropriate price signals are being sent and that environmental externalities have been internalized. High taxes on gasoline act as an incentive for public transportation use and development of alternative fuels.		

Indicator	GRAFT	**Collection**	ESI 2005
Indicator #	113	**Sub-Index**	
Indicator Name	Corruption measure		
Units	Standardized scale (z-score); with high scores corresponding to effective control of corruption		
Reference Year	2002		
Source	World Bank, Governance Indicators: 1996-2002, http://www.worldbank.org/wbi/governance/govdata2002/index.html (accessed December		
Methodology	Multi-pronged, experiential surveys of households, firms and public officials were used to measure social and economic costs of corruption. The quality of public service delivery, business, environmental, and public sector vulnerability were also examined, and the indicators on institutions, expenditure flows, and procurement were then added to yield the standardized score.		
Rationale	Corruption contributes to lax enforcement of environmental regulations and an ability on the part of producers and consumers to evade responsibility for the environmental harms they cause.		

Indicator	GOVEFF	**Collection**	ESI 2005
Indicator #	114	**Sub-Index**	
Indicator Name	Government effectiveness		
Units	Standardized score (z-score), with high values corresponding to high levels of effectiveness.		
Reference Year	2002		
Source	World Bank, http://www.worldbank.org/wbi/governance/govdata2002/index.html (accessed January 2005).		
Methodology	The World Bank aggregates 25 sources of information on governmental effectiveness to produce comparable indicators.		
Rationale	Governmental effectiveness is defined in this data set as "quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies." It is relevant for environmental sustainability because basic governmental competence enhances a society's ability to monitor and respond to environmental challenges.		

Indicator	PRAREA	**Collection**	ESI 2005
Indicator #	115	**Sub-Index**	
Indicator Name	Percentage of total land area under protected status		
Units	Percentage of total land area under protected status		
Reference Year	2003		
Source	United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC), World Database on Protected Areas (WDPA) Version 6, World Database on Protected Areas Consortium, Cambridge, U.K., August, 2003, accessed through the World Resources Institute (WRI) http://earthtrends.wri.org/ (accessed December 2003). Additional and updated country data as follows. Belgium: Royal Belgian Institute of Natural Sciences (RBINS), Marianne Schlesser, http://bch-cbd.naturalsciences.be/. Costa Rica: Sitema Nacional de Áreas Protegidas (SINAC) - Ministerio de Ambiente y Energia (MINAE), http://www.sinac.go.cr/asp/index.html. United Arab Emirates: Federal Environment Agency Ministry of Economy and Planning, "Survey of Protected Areas in United Arab Emirates".		
Methodology	Marine protected areas were subtracted from the total area of protected areas in order to limit the focus to land-based ecosystem protection.		
Rationale	The percentage of land area dedicated to protected areas represents an investment by the country in biodiversity conservation.		

Indicator	WEFGOV	**Collection**	ESI 2005
Indicator #	116	**Sub-Index**	
Indicator Name	World Economic Forum Survey on environmental governance		
Units	Principal components of several survey questions		
Reference Year	2003/4		
Source	World Economic Forum (WEF) Survey, The Global Competitiveness Report 2003-2004, Porter,		

Michael E. et al, Oxford University Press, 2003-2004, http://www.weforum.org/site/knowledgenavigator.nsf/Content/KB+Country+Profiles (accessed January 2005).

Methodology This represents principal components of survey questions addressing several aspects of environmental governance: air pollution regulations, chemical waste regulations, clarity and stability of regulations, flexibility of regulations, environmental regulatory innovation, leadership in environmental policy, consistency of regulation enforcement, environmental regulatory stringency, toxic waste disposal regulations, and water pollution regulations (questions Q1101-Q1111)

Rationale Effective governance is vital for environmental sustainability.

Indicator LAW **Collection** ESI 2005

Indicator # 117 **Sub-Index**

Indicator Name Rule of law

Units Standardized score (z-score), where high values correspond to high degrees of rule of law.

Reference Year 2002

Source World Bank, http://www.worldbank.org/wbi/governance/govdata2002/index.html (accessed January 2005).

Methodology The indicators measuring rule of law are defined as the extent to which agents have confidence in and
abide by the rules of society. They are: perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts.

Rationale The rule of law is important in terms of establishing the "rules of the game" for the civil society, the private sector, and government; for ensuring that violations of environmental regulations are enforced; and for promoting stable expectations that facilititate long-range planning.

Indicator AGENDA21 **Collection** ESI 2005

Indicator # 118 **Sub-Index**

Indicator Name Local Agenda 21 initiatives per million people

Units Number of Local Agenda 21 initiatives per million people

Reference Year 2001

Source For initiatives data: International Council for Local Environmental Initiatives (ICLEI), 2001, Second Local Agenda 21 Survey, Background Paper Number 15, New York, United Nations Department of Economic and Social Affairs (UNDESA), available in pdf at http://www.johannesburgsummit.org/html/documents/backgrounddocs/icleisurvey2.pdf (accessed January 2005).
For population data: World Bank, World Development Indicators (WDI) 2004, http://www.worldbank.org/data/wdi2004/.

Methodology For each country, the number of existing Local Agenda 21 initiatives was counted and divided by the total country population.

Rationale Local Agenda 21 (LA21) is an international sustainability planning process that provides an opportunity for local governments to work with their communities to create a sustainable

future. The number of Local Agenda 21 initiatives in a country measures the degree to which civil society is engaged in environmental governance.

Indicator	CIVLIB	**Collection**	ESI 2005
Indicator #	119	**Sub-Index**	
Indicator Name	Civil and Political Liberties		
Units	Average of political and civil liberties indices, each ranging from 1 (high levels of liberties) to 7 (low levels of liberties)		
Reference Year	2003		
Source	Freedom House, Freedom in the World, available in pdf at http://www.freedomhouse.org/research/freeworld/2003/averages.pdf (accessed January		
Methodology	Each country and territory was awarded from 0 to 4 raw points for each of 10 questions grouped into three subcategories in a political rights checklist, and for each of 15 questions grouped into four subcategories in a civil liberties checklist. The total raw points in each checklist correspond to two final numerical ratings of 1 to 7. These two ratings are then averaged to determine a status category of Free, Partly Free, or Not Free.		
Rationale	In countries that guarantee freedom of expression, rights to organize, rule of law, economic rights, and multi-party elections, there is more likely to be a vigorous public debate about values and issues relevant to environmental quality, and legal safeguards that encourage innovation.		

Indicator	CSDMIS	**Collection**	ESI 2005
Indicator #	120	**Sub-Index**	
Indicator Name	Percentage of variables missing from the CGSDI "Rio to Joburg Dashboard"		
Units	Percentage of variables missing		
Reference Year	2002		
Source	Consultative Group on Sustainable Development Indicators, Dashboard of Sustainability, "Rio to Joburg Dashboard," 2002, http://www.iisd.org/cgsdi/dashboard.asp (accessed January 2005), and Jochen Jesinghaus, personal communication, 9 January 2002.		
Methodology	The CGSDI (Consultative Group on Sustainable Development Indicators) published the "From Rio to Johannesburg" Dashboard. The index contains 60 indicators for more than 200 countries and is a tool for the assessment of the 10 years since the Rio Summit. The percentage of variables in the list of the CGSDI for which data are available for each country is calculated. Data coverage for the following variables was evaluated: Population, CO2 Fuel emissions, Other GHG, Urban air pollution (TSP), Arable and permanent crop Land area, Fertilizer consumption, Use of pesticides, Forest area, Population in coastal area, Withdrawal of ground and surface water, BOD in water bodies, Protected areas, Population living below poverty line (1ppp$/day), Gini coefficient, Unemployment total, Female/Male manufacturing wages, Prevalence of child malnutrition, Child mortality rate, Life expectancy at birth, Access to adequate sanitation, Access to safe water, WHO Index of overall health system attainment, Immunization, DPT or measles, Contraceptive prevalence, Persistence to Grade 5, Total adult literacy rate, Floor area in main city, Number of homicides, Population growth rate, percent population in urban areas, Income per capita, Investment, Current account balance, Value of external debt present, Aid given or received, Intensity of metals & minerals use, Commercial energy use, Renewable energy resources, Energy intensity of GDP, Municipal waste generated, Hazardous waste generated, Nuclear waste generated, Waste recycling paper or		

glass, Internet hosts, Telephone mainlines, Research and development expenditure. Not calculated for Taiwan.

Rationale The greater the number of missing variables, the poorer the data availability in that country. Environmental monitoring and data systems are vital for tracking progress towards environmental sustainability.

Indicator	IUCN	**Collection**	ESI 2005
Indicator #	121	**Sub-Index**	

Indicator Name IUCN member organizations per million population

Units Number of member organizations per million population

Reference Year IUCN memberships: 2004, Population: 2003

Source For membership data: IUCN-The World Conservation Union, http://www.iucn.org/members/Mem%20Statistics.htm (accessed January 2005); For population data: World Bank, World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed December 2004).

Methodology The number of IUCN member organizations is divided by the country's population (in millions). Countries for which no data on IUCN memberships is available are counted as having no memberships.

Rationale IUCN is the oldest international environmental membership organization, currently with more than 1000 members (governmental and NGO) worldwide, including the most significant environmental NGOs in each country.

Indicator	KNWLDG	**Collection**	ESI 2005
Indicator #	122	**Sub-Index**	

Indicator Name Knowledge creation in environmental science, technology, and policy

Units Average rank between 1 and 78 of three individual regressions with small values corresponding to above average performance

Reference Year 1993, 1998, 2003

Source Index based on data from Yale Center for Environmental Law and Policy, Knowledge Divide Project (Dr. Sylvia Karlsson, Tanja Srebotnjak, Patricia Gonzalez).
For covariates data: Research and Development (R&D) spending as % of GDP, Researchers per million people: World Bank, World Development Indicators 2003, http://www.worldbank.org/data/wdi2003/ (accessed January 2005), United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute of Statistics for selected R&D indicators, May 2004, http://www.uis.unesco.org/ev.php?ID=5180_201&ID2=DO_TOPIC (accessed January 2005); For GDP data: United Nations Statistics Division, Common Database, 2001 current GDP in USD, http://unstats.un.org/unsd/cdb/cdb_help/cdb_quick_start.asp (accessed January 2005); For Population data: World Bank, World Development Indicators 2003, http://www.worldbank.org/data/wdi2003/ (accessed January 2005).
Additional or updated country data as follows. Taiwan: Researchers per million inhabitants are based on figures from National Statistics Taiwan, the Republic of China, at http://www.dgbas.gov.tw/census~n/four/e4423.htm (accessed December 2004) using a rough factor of 1 in 10 professionals, scientific and technical services personnel is a researcher, R&D spending as percent of GDP, Taiwan Headlines citing data from the Directorate-General of Budget, Accounting & Statistics (DGBAS),

http://www.taiwanheadlines.gov.tw/20030402/20030402b3.html (accessed December 2004).

Methodology Publication of scientific knowledge in the top-rated peer-reviewed journals in the fields of environmental science, technology, and policy. We collected data on the primary author's institutional affiliation and the location where the research was carried out for 9 highly ranked peer-reviewed journals for each paper published during 1993, 1998, and 2003. The 9 journals are: Ecology, Conservation Biology, Environmental Science and Technology, Biological Conservation, Global Change Biology (founded in 1995), Environmental Health Perspectives, Water Resources Research, Environmental Toxicology and Chemistry, and Global Biogeochemical Cycles. Three regressions were carried out: Publications per author per million population ~ Researchers per million population + R&D spending as % of GDP + Publications per area and population; Publications about foreign countries ~ log(GDP) + Publications per area; Publications per area ~ Publications per author + Population. The residuals of each regression were ranked and aggregated to form an average rank score.

Rationale Creation and dissemination of knowledge about, inter alia, environmental, ecological, and socio-economic processes is important for achieving environmental sustainability for several reasons: i) it promotes decision-making on the basis of sound information and data, ii) it facilitates knowledge exchange and propagation between producers and users, iii) it allows adoption of new knowledge and technologies in other regions and sectors ("leapfrogging").

Indicator POLITY **Collection** ESI 2005

Indicator # 123 **Sub-Index**

Indicator Name Democracy measure

Units Trend-adjusted 10-year average score with high values corresponding to high levels of democratic institutions

Reference Year Average of 1993-2002 Polity IV scores

Source Polity IV Project "Political Regime Characteristics and Transitions", 1800-2002, Monty Marshall, University of Maryland, 2004, http://www.cidcm.umd.edu/inscr/polity/ (accessed January

Methodology Average of the Polity IV scores for 10 years 1993-2002 adjusted for trend: if the trend was positive, the average was increased by 1, if the trend was negative, the average was reduced by 1. The purpose of the adjustment was to reward improvement.

Rationale The presence of democratic institutions increases the likelihood that important environmental issues will be debated, that alternative views will be aired, and that decision-making and implementation will be carried out in an open manner. These factors improve the quality of environmental governance.

Indicator ENEFF **Collection** ESI 2005

Indicator # 124 **Sub-Index**

Indicator Name Energy efficiency

Units Terajoules energy consumption per million dollars GDP (PPP)

Reference Year MRYA 1998-2002

Source For energy consumption data: US Energy Information Agency (EIA), http://www.eia.doe.gov/emeu/iea/wecbtu.html (accessed January 2005); For GDP data: World

Bank, World Development Indicators 2004, GDP in PPP, http://www.worldbank.org/data/wdi2004/ (accessed December 2004).
Additional country data as follows: Taiwan: US Energy Information Administration (EIA), E.1g World Energy Intensity (Total Primary Energy Consumption, Per Dollar of Gross Domestic Product), 1980-2002, http://www.eia.doe.gov/pub/international/iealf/tablee1.xls, B.2 World Gross Domestic Product at Market Exchange Rates, 1980-2002, http://www.eia.doe.gov/pub/international/iealf/tableb2.xls.

Methodology The original data are in billion British Thermal Units (BTUs), which are converted to terajoules. The factor applied to convert 10^9 BTUs to terajoules is .9478 (Source: Energy Information Administration). Total energy consumption was normalized by GDP in million US dollars in purchasing power parities (PPPs).

Rationale The more efficient an economy is, the less energy it needs to produce a given set of goods and services.

Indicator RENPC **Collection** ESI 2005

Indicator # 125 **Sub-Index**

Indicator Name Hydropower and renewable energy production as a percentage of total energy consumption

Units Hydropower and renewable energy production as a percentage of total energy consumption

Reference Year MRYA 2002-2003

Source US Energy Information Agency, http://www.eia.doe.gov/emeu/iea/wecbtu.html (accessed January 2005).
Additional and updated country data as follows. Austria: Statistics Austria, for renewable energy, http://www.statistik.at/fachbereich_energie/neue_tab.shtml, for gross inland consumption, http://www.statistik.at/fachbereich_energie/gesamt_tab.shtml. Ireland: Sustainable Energy Ireland, National Energy Balances, www.sei.ie. Lithuania: Statistics Lithuania, Statistical Yearbook of Lithuania 2003. Mauritius: Central Statistics Office, Digest of Energy and Water Statistics, 2003, Table 4.1 and Table 3.3.

Methodology Hydroelectric, biomass, geothermal, solar and wind electric power production were calculated as a percent of total energy consumption. Some countries exceed 100 percent because they are net exporters of renewable energy.

Rationale The higher the proportion of hydroelectric and other renewable energy sources, the less reliance on more environmentally damaging sources such as fossil fuel and nuclear energy.

Indicator DJSGI **Collection** ESI 2005

Indicator # 126 **Sub-Index**

Indicator Name Dow Jones Sustainability Group Index (DJSGI)

Units Ratio of the market capitalization of the firms included in the 2005 Dow Jones Sustainability Index to the market capitalization of the firms eligible for inclusion in the Dow Jones Sustainability Index

Reference Year 2004-2005

Source Dow Jones SAM Sustainability Group, http://www.sustainability-index.com/htmle/djsi_world/members.html (accessed January 2005) and communication.

Methodology This variable measures the ratio of the market capitalization of the firms included in the 2005

Dow Jones Sustainability Index (World) and the market capitalization of the firms eligible for inclusion in the Dow Jones Sustainability Index (World). Market capitalization is as of 30 July 2004.

Rationale The Dow Jones Sustainability Group Index tracks a group of companies that have been rated as the top 10% in terms of sustainability. Firms that are already in the Dow Jones Global Index are eligible to enter the Sustainability Group Index. Countries in which a higher percentage of eligible firms meet the requirements have a private sector that is contributing more strongly to environmental sustainability.

Indicator ECOVAL **Collection** ESI 2005

Indicator # 127 **Sub-Index**

Indicator Name Average Innovest EcoValue rating of firms headquarted in a country

Units Average weighted score of EcoValue rating weighted by market capitalization share (values > 0 mean better environmental performance relative to peer countries, values < 0 mean poorer environmental performance)

Reference Year 2004

Source Innovest Strategic Value Advisors, http://www.innovestgroup.com (communication).

Methodology Each country starts with a neutral score (0.0 -- equal to Innovest's BBB). Then the weighted average EV21 score for all rated companies in a given country either raises or lowers the neutral weight. A relevance factor, based on EV21 coverage in a given country, determines the allowed deviation from neutral. Having a country score greater than zero means that, on average, companies in a given country have better environmental performance relative to their global peer group. Within each country, EcoValue levels were weighted by market capitalization share and then averaged to get a value for the individual country, based on the location of company headquarters.

Rationale The Innnovest EcoValue '21 rating measures environmental performance at the firm level. Countries in which firm-level scores are higher have a private sector that is contributing more strongly to environmental sustainability.

Indicator ISO14 **Collection** ESI 2005

Indicator # 128 **Sub-Index**

Indicator Name Number of ISO 14001 certified companies per billion dollars GDP (PPP)

Units Number of ISO 14001 certified companies per billion GDP in US dollars (PPP)

Reference Year ISO14001: 2003, GDP: MRYA 1998-2002

Source For ISO14001/EMAS registered companies: Reinhard Peglau, c/o Federal Environmental Agency, Germany, http://www.ecology.or.jp/isoworld/english/analy14k.htm (accessed December 2004); For GDP (PPP) data: World Bank World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed November 2004), UNSD Common Database, GDP at market prices, current prices, US$ (UN Estimates) for Andorra, Brunei Darussalam, Liechtenstein, Monaco, Myanmar, Puerto Rico, and Qatar, http://unstats.un.org/unsd/cdb/cdb_help/cdb_quick_start.asp (accessed January 2005).

Methodology Number of ISO 14001 certified companies divided by their GDP in billion US dollars (PPP).

Rationale ISO 14001 specifies standards for environmental management. The more firms that receive ISO 14001 certification, the more likely it is that industries are instituting management practices that reduce waste and resource consumption.

Indicator	WEFPRI	**Collection**	ESI 2005
Indicator #	129	**Sub-Index**	
Indicator Name	World Economic Forum Survey on private sector environmental innovation		
Units	Principal components of several survey questions		
Reference Year	2003/4		
Source	World Economic Forum (WEF) Survey, The Global Competitiveness Report 2003-2004, Porter, Michael E. et al, Oxford University Press, 2003-2004, http://www.weforum.org/site/knowledgenavigator.nsf/Content/KB+Country+Profiles (accessed January 2005).		
Methodology	This represents principal components of survey questions addressing several aspects of private sector environmental innovation: environmental competitiveness, prevalence of environmental management systems, and private sector cooperation with government (questions Q1112-1114).		
Rationale	Private sector innovation contributes to solutions to environmental problems.		

Indicator	RESCARE	**Collection**	ESI 2005
Indicator #	130	**Sub-Index**	
Indicator Name	Participation in the Responsible Care Program of the Chemical Manufacturer's Association		
Units	Score from 0 (low) to 4 (high) levels of participation		
Reference Year	2002		
Source	International Council of Chemical Associations (ICCA), Responsible Care Status Report 2002, Appendix 4, http://www.icca-chem.org/pdf/icca004.pdf (accessed January 2005).		
Methodology	The Responsible Care Program is an initiative of the chemical industry. Eight or more years of membership was considered a mature membership and allocated four points. Five to seven years of membership was considered a senior membership and allocated three points.Two to four years of membership was considered a junior membership and allocated 2 points. Up to one year of membership was considered a new membership and allocated 1 point. Not a member = 0 points.		
Rationale	Responsible Care is an initiative of the global chemical industry in which companies, through their national associations, commit to work together to continuously improve the health, safety and environmental performance of their products and processes, and so contribute to the sustainable development of local communities and of society as a whole (Source: ICCA Responsible Care Status Report 2002, URL: http://www.icca-chem.org/rcreport/). Responsible handling of chemicals is important for environmental sustainability.		

Indicator	INNOV	**Collection**	ESI 2005
Indicator #	131	**Sub-Index**	
Indicator Name	Innovation Index		
Units	Standardized score between 1 (lowest) and 7 (highest)		
Reference Year	2003/4		

Source World Economic Forum, 2003-2004 Global Competitiveness Report, http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5CGlobal+Competitiveness+Report (accessed January 2005).

Methodology Objectively measures national innovation capacity of countries through indicators including investment in research and development and the number of new US patents.

Rationale This index measures the underlying capacity of a country to engage in technological innovation by examining factors such as scientific infrastructure and policy environment.

Indicator DAI **Collection** ESI 2005

Indicator # 132 **Sub-Index**

Indicator Name Digital Access Index

Units Score between 0 and 1 with higher scores corresponding to better access

Reference Year 2003

Source Digital Access Index (DAI) of the International Telecommunication Union (ITU), http://www.itu.int/ITU-D/ict/dai/ (accessed December 2005).

Methodology The DAI is a composite index composed of the equally average of Infrastructure, Affordability, Knowledge, Quality, and Usage. Each subcomponent is comprised of the weighted average of benchmarked variables. The variables and their weights are fixed telephone subscribers per 100 inhabitants (weight 0.5), Mobile cellular subscribers per 100 inhabitants (0.5), Internet access price as percentage of GNI per capita (1), Adult literacy (0.66), Combined primary, secondary, and tertiary school enrolment level (0.33), International internet bandwidth (bits) per capita (0.5), Broadband subscribers per 100 inhabitants (0.5), Internet users per 100 inhabitants (1).

Rationale The Internet has created a new economy and promoted an unprecedented increase in the amount of environmental information that can be accessed and disseminated worldwide. Access to the Internet thus is important for access to information, stakeholder participation, decision-making, and generation of innovative solutions to environmental problems.

Indicator PECR **Collection** ESI 2005

Indicator # 133 **Sub-Index**

Indicator Name Female primary education completion rate

Units Female primary education completion rate as percentage of females in the relevant age group

Reference Year MRYA 1998-2003

Source United Nations Educational, Scientific and Cultural Organization (UNESCO), Institute for Statistics. Global Education Digest 2004 - Comparing Education Statistics Across the World. Montreal, 2004 accessed from the UNSD Millennium Indicator Database, http://millenniumindicators.un.org/unsd/mi/mi_series_xrxx.asp?row_id=745 (accessed January 2005), and the World Bank World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed January 2005).
Additional and updated country data as follows. Albania: Albanian Institute of Statistics, Annual Statistical Report of Education 2002-2003. Austria: Statistics Austria. Italy: Ministero dell'Istruzione, dell'Università e della Ricerca, http://www.miur.it/; and Istat Rapporto Annuale, 2003, http://www.istat.it/. Lithuania: Statistics Lithuania, http://www.std.lt or Eurostat's website http://europa.eu.int/comm/eurostat. Mauritius: Digest of Educational Statistics, 2003, Table 3.22, http://statsmauritius.gov.mu/hs/edu/hs.htm. Nepal: Central Bureau of Statistics,

Nepal, Population Census 2001. Taiwan: Directorate General of Budget Accounting and Statistics, Socio-Economic Data of Taiwan, http://www.dgbasey.gov.tw/dgbas03/bs2/gender/n9111.htm. United Arab Emirates: Ministry of Education & Youth, Annual Statistical Report 2003. Zimbabwe: Central Statistical Office, Education Statistics in Zimbabwe.

Methodology The proxy indicator for the primary completion rate is the gross intake rate at the last grade of primary education. It is calculated as the total number of new entrants in the last grade of primary education, regardless of age, expressed as a percentage of the population of the theoretical entrance age to the last grade (Source: UNESCO Institute for Statistics). Survival rates may at times exceed 100 due to fluctuations in enrolment. Where such results are published they should be interpreted as the country having a survival rate approaching 100%. Completion rates exceeding 100% are set to 100% so as not to give countries with greater than 100% PECR an advantage over countries with real or close to 100% PECR.

Rationale Female education is widely seen as an important factor for social and economic development. It also correlates with the overall level of schooling of a country and hence with the environmental and technological awareness, reduced incidences of water-borne diseases, and increased participation in decision-making at the household level.

Indicator ENROL **Collection** ESI 2005

Indicator # 134 **Sub-Index**

Indicator Name Gross tertiary enrollment rate

Units Percentage of pupils (both sexes) of relevant age enrolled at tertiary level of schooling

Reference Year MRYA 1999-2003

Source United Nations Educational, Scientific and Cultural Organization Institute for Statistics (UNESCO-UIS), http://www.uis.unesco.org/ev.php?URL_ID=5187&URL_DO=DO_TOPIC&URL_SECTION=201 (accessed January 2004).
Additional or updated country data as follows. Albania: Albanian Institute of Statistics, Annual Statistical report of Education 2002-2003. Austria: Statistics Austria, EU data collection (common data collection of UNESCO, OECD and EUROSTAT), school and university statistics. Finland: Statistics Finland, Statistical Yearbook 2003. Italy: Ministero dell'Istruzione, dell'Università e della Ricerca, http://www.miur.it/ and Istat “Università e Lavoro,” http://www.istat.it/DATI/unilav2004/index.html. Lithuania: Statistics Lithuania, various publications at http://www.std.lt or http://europa.eu.int/comm/eurostat. Mauritius: Central Statistics Office, “Participation tertiary education/ Tertiary Education Commission, 2003”. Taiwan: Ministry of Education, Taiwan, The international comparative indices for education, http://www.edu.tw/EDU_WEB/EDU_MGT/STATISTICS/EDU7220001/temp1/overview.files/frame.htm?open. United Arab Emirates: Ministry of Education & Youth, Annual Statistical Report 2003. Zimbabwe: Central Statistical Office 2003, Zimbabwe.

Methodology The measure was calculated on the basis of pupils enrolled in tertiary educational institutions as a proportion of the population in the relevant official age group.

Rationale The higher the level of education within a population, the higher the capacity for scientific and technological innovation, environmental awareness and ability to address environmental problems.

Indicator RESEARCH **Collection** ESI 2005

Indicator # 135 **Sub-Index**

Indicator Name Number of researchers per million inhabitants

Units Number of researchers per million inhabitants

Reference Year 2003

Source United Nations Economic, Scientific and Cultural Organization (UNESCO), Institute for Statistics, http://www.uis.unesco.org/ev.php?ID=5180_201&ID2=DO_TOPIC (accessed January 2005). Data on Researchers per million inhabitants for Taiwan are based on figures from National Statistics Taiwan, the Republic of China, at http://www.dgbas.gov.tw/census~n/four/e4423.htm (accessed 30 December 2004) using a rough factor of 1 in 10 professionals, scientific and technical services personnel is a

Methodology The variable measures the number of scientific researchers per million inhabitants. Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the planning and management of R&D projects. Post-graduate students engaged in R&D are considered as researchers.

Rationale Scientific capacity is important for the development of new technologies for sustainable environmental management.

Indicator EIONUM **Collection** ESI 2005

Indicator # 136 **Sub-Index**

Indicator Name Number of memberships in environmental intergovernmental organizations

Units Number of memberships environmental intergovernmental organizations (out of a maximum of 100)

Reference Year 2003-2004

Source Yearbook of International Organizations 2003/04. Electronic access by subscription through Union of International Associations, http://db.uia.org/scripts/sweb.dll/a?DD=OR (accessed January 2005). List of environmental intergovernmental organizations available at http://www.yale.edu/envirocenter/esifaq.htm.
Additional or updated country data as follows. Republic of Korea: Ministry of the Environment, Policy Coordination Division.

Methodology Based on a list of 100 Intergovernmental organizations classified as "environmental" and selected by the ESI Team, the number of memberships for each country were counted.

Rationale Countries contribute to global environmental governance by participating in intergovernmental environmental organizations.

Indicator FUNDING **Collection** ESI 2005

Indicator # 137 **Sub-Index**

Indicator Name Contribution to international and bilateral funding of environmental projects and development aid

Units Score from 0-100 based on aid given and aid received (0 corresponds to low levels of aid and 100 corresponds to high levels of aid)

Reference Year 2004

Source For aid data: Global Environmental Facility (GEF) contributions and receipts and Organisation for Economic Co-operation and Development (OECD) bilateral environmental aid; For ancillary economic data (GNI, PPP, USD current income): World Bank, World Development Indicators 2004, http://www.worldbank.org/data/wdi2004/ (accessed November 2004); For population

data: CIA World Factbook, http://www.cia.gov/cia/publications/factbook/ (accessed November 2004).

Methodology Two sets of rank percentiles based on standardized residuals were combined. The first is based on the residuals from regressing log aid donated on log population, log gni, log gni/cap, and (log gni)^2. The second set of rank percentiles is based on the residuals from regressing log aid received on the same regressors. Three countries have both donations and receipts and in these cases the most favorable rank was chosen.

Rationale Participation in environment and development assistance programs, either as a donor or a recipient (depending on income level), is an important sign of government commitment to environmental sustainability.

Indicator PARTICIP **Collection** ESI 2005

Indicator # 138 **Sub-Index**

Indicator Name Participation in international environmental agreements

Units Score between 0 and 1 with 0 corresponding to no participation and 1 to full participation

Reference Year 2004

Source Membership information, national communications, and initiatives related to the following conventions: United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, http:// www.unfccc.org (accessed October 2004), Vienna Convention on the Protection of the Ozone Layer and Montreal Protocol with amendments, http://www.unep.org/ozone/Treaties_and_Ratification/2A_vienna%20convention.asp (accessed October 2004), Convention on the Trade in Endangered Species (CITES), http://www.cites.org (accessed October 2004), Basel Convention on the Transboundary Movement of Hazardous Waste, http://www.basel.int (accessed October 2004), United Nations Convention to Combat Desertification (UNCCD), http://www.unccd.org (accessed October 2004), United Nations Convention on Biological Diversity, http://www.biodiv.org (accessed October 2004), and The Ramsar Convention on Wetlands and the Cartagena Protocol http://www.ramsar.org/ (accessed October 2004).

Methodology For each convention, protocol, and amendment points were allocated as follows: 1 point for signature, accession, and ratification without signature. An additional point for ratification with signature, acceptance, approval, or succession. The maximum number of points achievable is: 2 points for UNCCD, 12 points for Vienna Convention, Montreal Protocol, and its Amendments, 2 points for CITES, 4 points for UNFCCC and the Kyoto Protocol, 2 points for the Basel convention, 4 points for UNCBD, and 4 points for the Ramsar convention and the Cartagena Protocol. Due to the varying allocation of points, the observed value for each convention/protocol was re-scaled from 0-1 by dividing the observed points by the maximum number of points achievable. The re-scaled values were then aggregated using equal weights of 1/7 each. Countries or territories not listed under the list of parties to a convention/protocol/amendment were assigned 0 points for the respective convention/protocol/amendment.

Rationale Participation in international environmental efforts should be measured beyond signatures to treaties. For this reason, this variable combines ratifications of treaties and conventions with the level of active participation in, contribution to, and compliance with the treaties' obligations.

Indicator	CO2GDP	**Collection**	ESI 2005
Indicator #	139	**Sub-Index**	

Indicator Name Carbon emissions per million US dollars GDP

Units Metric tons of carbon emissions per million GDP in constant 1995 US dollars

Reference Year 2000

Source For CO2 emission data: Carbon Dioxide Information Analysis Center (CDIAC), http://cdiac.esd.ornl.gov/trends/emis/tre_coun.htm (accessed January 2005); For GDP data: World Bank World Development Indicators 2004, GDP in constant 1995 US dollars, http://www.worldbank.org/data/wdi2004/ (accessed December 2004). Alternative GDP data as follows: Peoples Republic of Korea: from United Nations Statistics Division Common Database (UNCDB), GDP at market prices, current prices, USD for 2000 (UN Estimates), http://unstats.un.org/unsd/cdb/cdb_help/cdb_quick_start.asp (accessed December 2004), Cuba, Libya, and Myanmar: CIA World Fact Book 2004 GDP USD (PPP), http://www.cia.gov/cia/publications/factbook/ (accessed December 2004). Additional or updated country data as follows. Taiwan: CO2 data from CDIAC, http://cdiac.esd.ornl.gov/ftp/ndp030/nation00.ems, GDP data from US Energy Information Administration (EIA), B.2 World Gross Domestic Product at Market Exchange Rates, 1980-2002, http://www.eia.doe.gov/pub/international/iealf/tableb2.xls (in constant 1995 USD).

Methodology Total annual CO2 emissions in metric tons have been normalized by million GDP in constant 1995 US dollars for each country. For the People's Republic of Korea, World Bank data were not available and GDP at market prices, so current prices, US$ (UN estimates) for 2000 were used instead.

Rationale Emissions of carbon dioxide are not immediately harmful to any given country but contribute to global climate change. Every country emits carbon dioxide. However, the amount of emissions per unit economic activity varies widely, with some countries being far more efficient than others.

Indicator	CO2PC	**Collection**	ESI 2005
Indicator #	140	**Sub-Index**	

Indicator Name Carbon emissions per capita

Units Metric tons of carbon emissions per capita

Reference Year MRYA 1996-2001

Source Carbon emissions per capita: United Nations Statistics Division, Millennium Indicator Database, based on data from United Nations Framework Convention on Climate Change-United Nations Department of Economic and Social Affairs (UNFCCC-UNDESA), http://unstats.un.org/unsd/mi/mi_goals.asp (accessed January 2005). Additional or updated country data as follows. Taiwan: CO2 data from Carbon Dioxide Information Analysis Center (CDIAC), http://cdiac.esd.ornl.gov/ftp/ndp030/nation00.ems, Population data from Ministry of the Interior, Taiwan Population Database, http://www.ris.gov.tw/ch4/static/st20-1.xls. Slovenia: CO2 and Population data from, UNFCCC, National Inventory Report

Methodology Total annual carbon dioxide emissions in metric tons of carbon were normalized by total population (de facto) for each country for the same year. For Slovenia the most recent available non-zero figure was for the year 1996, for the Ukraine for the year 1998, and for the Russian Federation for the year 1999.

Rationale Emissions of carbon dioxide are not immediately harmful to any given country, but contribute to

climate change. Every country emits some carbon dioxide, but the amount per person varies widely, with some countries having much lower per capita emissions than others.

Indicator	SO2EXP	**Collection**	ESI 2005
Indicator #	141	**Sub-Index**	
Indicator Name	SO2 Exports		
Units	Gigagrams of SO2 produced in country that is carried across its boundaries to other countries		
Reference Year	EMEP: 2001, IIASA Europe: 2000, IIASA RAINS-Asia: 1997		
Source	The Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe Meteorological Synthesizing Centre West Status Report (EMEP_MSC-W) 2003, ISSN 0804-2446, http://webdab.emep.int/ (accessed January 2005), and US Committee for the International Institute for Applied Systems Analysis (IIASA) Regional Air Pollution Information and Simulation Europe (IIASA_RAINS_Europe), http://www.iiasa.ac.at/rains/Rains-online.html?sb=8 (accessed January 2005) and IIASA RAINS-Asia data from the 2002 ESI.		
Methodology	The data are merged from EMEP, IIASA Europe, and IIASA RAINS-Asia. Kola and the rest of the Russian Federation are aggregated to the Russian Federation (RUS) in the EMEP data.		
Rationale	The transport of sulfur emissions across territorial boundaries contributes to poor air quality and acid rain in receiving countries.		

Indicator	POLEXP	**Collection**	ESI 2005
Indicator #	142	**Sub-Index**	
Indicator Name	Import of polluting goods and raw materials as percentage of total imports of goods and		
Units	Import of polluting goods and raw materials as percentage of total imports of goods and services		
Reference Year	2002		
Source	United Nations Commodity Trade Statistics database (COMTRADE), Department of Economic and Social Affairs/ Statistics Division, available online at http://unstats.un.org/unsd/comtrade/ (accessed December 2004), World Bank World Development Indicators 2004 for Total Imports of Goods and Services in current 2002 USD.		
Methodology	The following commodities from the Harmonized Commodity Description and Coding System (HS-1996) are used: salt, sulphur, earth, stone, plaster, lime and cement; ores, slag and ash; paper and paperboard, articles of pulp, etc.; stone, plaster, cement, asbestos, mica, etc.; iron and steel; copper, nickle, aluminum, lead, zinc, tin, other base metals, cermet, and articles thereof; nuclear reactors, boilers, machinery, etc.; vehicles other than railway, tramway; ships, boats and other floating structures; and aircraft, spacecraft, and parts thereof. The import data in US dollars for these codes are added up and divided by the value of total imports of goods and services in US dollars. Countries with no recorded imports of goods and raw materials for the selected HS codes were set to missing.		
Rationale	Countries that import a large volume of commodities that are associated with negative environmental externalities at the point of extraction or processing may not be pursuing an environmentally sustainable path because of the likelihood that their actions are contributing to damage abroad. This measure does not take into account variation in actual environmental externalities within exporting countries, nor does it factor in other relevant imports that are not classified as commodities; as such it should be considered a rough proxy.		

Collection 3: 2004 Environmental Vulnerability Index

Indicator	EVI	**Collection**	EVI 2004
Indicator #	143	**Sub-Index**	

Indicator Name Environmental Vulnerability Index (EVI)

Units Unitless index score (ranging from 174 low vulnerability to 450 for high vulnerability)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology The EVI is based on 50 indicators for estimating the vulnerability of the environment of a country to future shocks. These indicators are combined by simple averaging and reported simultaneously as a single index, a range of policy-relevant thematic sub-indices and as a profile showing the results for each indicator. Simple averages across indicators are used because they can be easily understood and more complex models do not appear to offer any advantages to the expression or utility of the index. This overview with drill-down structure means that in addition to an overall signal of vulnerability, the EVI can be used to identify specific problems. The EVI has been designed to reflect the extent to which the natural environment of a country is prone to damage and degradation. It does not address the vulnerability of the social, cultural or economic systems, nor the environment that has become dominated by those same human systems (such as cities and farms) because these are included in the economic and social vulnerability indices which are needed separately to identify trade-offs. Therefore, the natural environment includes those biophysical systems that can be sustained without direct and/or continuing human support. The environment at risk includes ecosystems, habitats, populations and communities of organisms, physical and biological processes (such as beach building and reproduction), productivity and energy flows, diversity at all levels, and interactions among them all. Each of these ecosystem goods, services and relationships may be affected by natural and human hazards, the risk of which may vary with time, place and human choices and behaviour.

The scores range as follows:

Extremely vulnerable	365+
Highly vulnerable	315-364
Vulnerable	265-314
At risk	215-264
Resilient	<264

Indicator	HAZARDS	**Collection**	EVI 2004
Indicator #	144	**Sub-Index**	

Indicator Name Risk of Natural Hazards Occuring

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology The theory behind the EVI identifies three aspects, which can be identified wherever vulnerability is considered. These are: (i) the risk of hazards occurring, (ii) the inherent resistance to damage and (iii) the acquired vulnerability resulting from past damage. The risk

associated with hazards is dependent on the frequency and intensity of events that, by definition, may adversely affect the environment.

Rationale Risks to the natural environment include any events or processes that can cause damage. These include natural and human events and processes, such as the weather and pollution. It has been suggested that natural hazards should not be included in discussions of environmental vulnerability because unless we identify certain natural events as being altered by humans (e.g. human-induced sea-level rise), all natural events must be 'normal' and are therefore not part of vulnerability. This view implies that nature cannot damage nature and/or that natural hazards operate more-or-less in isolation. Natural and human hazards affect the environment in interactive ways, therefore an integrated approach is required when analysing vulnerability issues. For example, the effects of cyclones on natural communities are worse where marine and shoreline ecosystems have been degraded by pollution and over-harvesting. High levels of natural disturbance can drive populations of organisms down to low levels or make their populations more variable. This in turn, makes the risk of local extinction from other hazards more likely. The frequency and intensity of natural disturbances cannot be separated from the effects of human disturbances and needs to be incorporated in the concept of environmental vulnerability.

Indicator RESISTANCE **Collection** EVI 2004

Indicator # 145 **Sub-Index**

Indicator Name Resistance to Damage

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology The theory behind the EVI identifies three aspects, which can be identified wherever vulnerability is considered. These are: (i) the risk of hazards occurring, (ii) the inherent resistance to damage and (iii) the acquired vulnerability resulting from past damage. The risk associated with hazards is dependent on the frequency and intensity of events that, by definition, may adversely affect the environment. The inherent resilience or resistance of the environment refers to the innate characteristics of a country that would tend to make it more or less able to cope with natural and anthropogenic hazards. For example, Nepal is inherently invulnerable to sea-level rise, regardless of the worldwide level of risk and any other damage that might be sustained to its environments.

Indicator DAMAGE **Collection** EVI 2004

Indicator # 146 **Sub-Index**

Indicator Name Vulnerability Resulting from Past Damage

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology The theory behind the EVI identifies three aspects, which can be identified wherever vulnerability is considered. These are: (i) the risk of hazards occurring, (ii) the inherent resistance to damage and (iii) the acquired vulnerability resulting from past damage. The risk associated with hazards is dependent on the frequency and intensity of events that, by definition, may adversely affect the environment. The inherent resilience or resistance of the environment refers to the innate characteristics of a country that would tend to make it more or

less able to cope with natural and anthropogenic hazards. For example, Nepal is inherently invulnerable to sea-level rise, regardless of the worldwide level of risk and any other damage that might be sustained to its environments. Acquired vulnerability arises from damage sustained in the past and is related to the ecological integrity or level of degradation of ecosystems. The underlying assumption is that the more degraded the ecosystems of a country (as a result of past natural and anthropogenic hazards), the more vulnerable they are likely to be to future hazards.

Indicator	CCEVI	**Collection**	EVI 2004
Indicator #	147	**Sub-Index**	
Indicator Name	Climate Change Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Climate Change Sub-Index of the EVI represents an unweighted average of the scores for the following variables: WINDEVI, DRYEVI, WETEVI, HOTEVI, SSTEVI, LANDEVI, DISPEVI, RELIEFEVI, LOWEVI, VEGEVI, WATEREVI, POPDNEVI, and CSTPOPEVI.		

Indicator	ENDEVI	**Collection**	EVI 2004
Indicator #	148	**Sub-Index**	
Indicator Name	Exposure to Natural Disasters Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Agriculture & Fisheries Sub-Index of the EVI represents an unweighted average of the scores for the following variables: WINDEVI, DRYEVI, WETEVI HOTEVI, COLDEVI, VOLCANOESI, EARTHQKEVI, TSUNAMIEVI, SLIDESEVI, POPDNEVI, and CSTPOPEVI.		

Indicator	HHEVI	**Collection**	EVI 2004
Indicator #	149	**Sub-Index**	
Indicator Name	Human Health Aspects Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Human Health Aspects Sub-Index of the EVI represents an unweighted average of the scores for the following variables: Fertilisers (FERTLEVI), Pesticides (PESTCDEVI), Water (WATEREVI), Sulphur Dioxide (SULPHEVI), Waste Treatment (TRTMNTEVI), and Sanitation (SANEVI).		

Indicator	AFEVI	**Collection**	EVI 2004
Indicator #	150	**Sub-Index**	
Indicator Name	Agriculture and Fisheries Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Agriculture & Fisheries Sub-Index of the EVI represents an unweighted average of the scores for the following variables: DRYEVI, WETEVI, SSTEVI, IMBALEVI, OPENEVI, MIGEVI, INTROEVI, VEGEVI, VEGLOEVI, FRAGEVI, DEGEVI, MPAEVI, FARMEVI, FERTLEVI, PESTCDEVI, BIOTECHEVI, PRDOFEVI, FSHEFEVI, and WATEREVI.		

Indicator	WATEVI	**Collection**	EVI 2004
Indicator #	151	**Sub-Index**	
Indicator Name	Water Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Desertification Sub-Index of the EVI represents an unweighted average of the scores for the following variables: DRYEVI, WETEVI, VEGEVI, VEGLOEVI, DEGEVI, RESRVEVI, FERTLEVI, PESTCDEVI, WATEREVI, TRTMNTEVI, SANEVI, POPDNEVI, and POPGRTHEVI.		

Indicator	CCDEVI	**Collection**	EVI 2004
Indicator #	152	**Sub-Index**	
Indicator Name	Desertification Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	The Desertification Sub-Index of the EVI represents an unweighted average of the scores for the following variables: WINDEVI, DRYEVI, WETEVI, HOTEVI, COLDEVI, RELIEFEVI, LOWEVI, VEGEVI, VEGLOEVI, DEGEVI, and WATEREVI.		

Indicator	CBDEVI	**Collection**	EVI 2004
Indicator #	153	**Sub-Index**	
Indicator Name	Biodiversity Sub-Index		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology The Biodiversity Sub-Index of the EVI represents an unweighted average of the scores for the following variables: SSTEVI, LANDEVI, DISPEVI, ISOLEVI, RELIEFEVI, LOWEVI, BORDEVI, IMBALEVI, OPENEVI, MIGEVI, ENDEMEVI, INTROEVI, ENDANGEVI, EXTINCTEVI, VEGEVI, VEGLOEVI, FRAGEVI, RESRVEVI, and MPAEVI.

Indicator WIND **Collection** EVI 2004

Indicator # 154 **Sub-Index**

Indicator Name High Winds

Units Values are total knots of excess wind per year.

Reference Year 1999-2003

Source NOAA DATSAV3 Surface SOD 1973-2003. National Climatic Data Centre, 151 Patton Avenue, Asheville, NC 28801-5001

Additional Sources:

Cook Is. - Data archive of Cook Islands Met Services (CIMS) Director, Met Services; Fiji - Ashmita Gosai (724888); Fiji - FMS Annual Weather Summary 1997 & 1998. Fiji Meteorological Service; Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Kirion Kabunateiti. Climate Archive from Kiribati Meteorology Services (KMS); Nepal - Various Issues of Climatological Records of Nepal. Department of Hydrology and Meteorology. Kathmandu, Nepal; New Zealand - National Institute of Water and Atmospheric Research, New Zealand. Mr A. C Penney. E.Mail: a.penney@niwa.cri.nz; Niue - David Poihega (4196/ 4602/ upoihega@yahoo.com) Niue Meteorology Services; Palau - Federal Climate Complex Asheville; Singapore - Mr Wong Teo Suan ++(65) 5457191 ++(65) 5457192. Meteorological office Singapore; Thailand - Climatology Division Meteorology Department. 21/08/2001; Tonga - Ofa Fa'anunu (676 23401/ 24145/ Tongamet@kalianet.to) Climate Archive, Tonga Meteorology Services (TMS).

Methodology Values are total knots of excess wind per year. These are as annual averages over the past 5 years of summed deviations of daily maximum windspeeds that are more than 20% higher than the 30 year monthly mean maximum wind speeds, calculated for each climate station in a country and then averaged over all climate stations.

Average annual excess wind over the last five years (summing speeds on days during which the maximum recorded wind speed is greater than 20% higher than the 30 year average maximum wind speed for that month) averaged over all reference climate stations.

Raw values of summed deviations were adjusted for each individual climate station to account for missing days of data. This was done by multiplying the summed deviations across days with more than 20% higher maximum wind speed, by the total number of days in the 5 year period (1826 days) and dividing by the number of days for that station that had data (many stations have missing days) = [(Deviations * 1826) / days with data]. The adjustment was done to ensure stations with fewer days of data were comparable with those which had more.

In its original form, this indicator called for data on the number of days with >20% higher maximum wind speeds over the 30-year mean. We adjusted the indicator to sum all the deviations above the threshold so that countries with only slight excess could be distinguished from those with large ones.

Rationale Vulnerability to cyclones, tornadoes, storms, erosion, habitat damage, disturbance. This indicator captures the likelihood of damage from frequent and severe wind that can affect forests, fan fires, create storm surges, dry soils, spread air pollution, and interact with other

stressors. Because this indicator is expressed in relation to the 30 year monthly means, a high score could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards. The signal generated captures not only the frequency of high winds, but also their strength.

Indicator	WINDEVI	**Collection**	EVI 2004
Indicator #	155	**Sub-Index**	

Indicator Name High Winds (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable WINDS the authors applied the following break off values (where X is the log of knots):

EVI Score = 1 $X \leq 5$
EVI Score = 2 $5 < X \leq 5.3$
EVI Score = 3 $5.3 < X \leq 5.6$
EVI Score = 4 $5.6 < X \leq 5.9$
EVI Score = 5 $5.9 < X \leq 6.1$
EVI Score = 6 $6.1 < X \leq 6.4$
EVI Score = 7 $6.4 < X$

Rationale Vulnerability to cyclones, tornadoes, storms, erosion, habitat damage, disturbance. This indicator captures the likelihood of damage from frequent and severe wind that can affect forests, fan fires, create storm surges, dry soils, spread air pollution, and interact with other stressors. Because this indicator is expressed in relation to the 30 year monthly means, a high score could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards. The signal generated captures not only the frequency of high winds, but also their strength.

Indicator	DRY	**Collection**	EVI 2004
Indicator #	156	**Sub-Index**	

Indicator Name Dry periods

Units Millimetres of rainfall deficit (negative value). Total rainfall deficit in mm over the past 5 years, averaged over all stations and months for which there were data. Final values expressed as annual figures.

Reference Year 1999-2003 for most countries. Other data from 1965, 1966, 1976.

Source NOAA GHCN http://www.ncdc.noaa.gov/oa/pub/data/ghcn/v2/ghcnftp_zipd.html; In-country

Additional Sources:

Cook Islands - Meteorology Office. Nga Rauraa (+682 20603/ 682 21603); Federated States of Micronesia - NOAA/ NCDC - 1999 Local Climate Data/ NCDC. Caesar Hadley. WSO Pohnpei - NWSPR/ NOAA; Fiji - Ashmita Gosai (+679-724888); Greece - Dr Paula Scott (ph&f: +30-81-861219, cariad@her.forthnet.gr); Kiribati - Kirion Kabunateiti. Climate Archive from Kiribati Meteorology Services (KMS); Marshall Islands - NOAA NCDC Ashville. Local Climatological Data (LCD). Lee Z Jacklick; Nauru - Nauru Meteorology Services. Frank W Davey; Nepal - Various issues of Climatological records of Nepal. Soroj Kumar Baidhya (MR) Phone ++(1) 255920; New Zealand - National Institute of Water and Atmospheric Research, New Zealand.

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Palau - Maria Ngemaes (680 4881034, maria.ngemaes@noaa.gov) Weather Service Office (National Weather Service); Papua New Guinea - Climatic Tables for PNG. McAlphine, J. R.; Keig, G.; and Short, K. PNG National Weather Service; Philippines - Climatological Normals. Ms Panfila E. Gica / Climate Data Section / PAGASA
Samoa - Niko Tualevao. Apia Observatory/ Samoa Meteorology; Singapore - Mr Wong Teo Suan ++(65) 5457191 ++(65) 5457192. Meteorological office Singapore; Thailand - Climatology Division Meteorological Department 21 Aug 2001 local_climate@tmdnet.motc.go.th ; Tonga - Ofa Fa'anunu (676 23401/ 24145/ Tongamet@kalianet.to) Climate Archive, Tonga Meteorology Services (TMS); Trinidad & Tobago - Debbie Ramnarine; Tuvalu - Tuvalu Meteorology Services (TMS). Hilia Vavae; Vanuatu - Vanuatu Meteorology Services (VMS). Mr Kaniaha Salesa (678 23866/ 22310/ climate@meteo.vu).

Methodology Average annual rainfall deficit (mm) over the past 5 years for all months with >20% lower rainfall than the 30 year monthly average, averaged over all reference climate stations.

1. This indicator is focused on the size of the rainfall deficit across all climate stations in countries, so takes into account vastly different climates (assessing deficit only in terms of one climate station at a time and then averaging them across stations).

2. Contiguous months of drought are not captured separately from isolated months. Effects are likely to be worse for areas in which the deficit is on-going.

3. The researchers upgraded the indicator from an earlier simpler form to measure the strength of the deficit, if one exists. This gives a better picture of vulnerability because it separates 'minor' droughts from major ones.

Rationale Vulnerability to drought, dry spells, stress on surface water resources. This indicator captures not only the number of months with significantly lower rainfall, but also the strength of the deficit. Two countries could have the same average number of months over the past 5 years with less than 20% lower than the monthly average rainfall, with one only having a small deficit, while another a very large one. This indicator ensures that the amount of rain 'missed' is captured. Frequent and severe drought months could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. fires, water movements, ability of ecosystems to attenuate pollution).

Indicator DRYEVI **Collection** EVI 2004

Indicator # 157 **Sub-Index**

Indicator Name Dry periods (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable DRY the authors applied the following break off values (where X is the log of the absolute value of the number of dry spells between 1999 and 2003):

EVI Score = 1 $X \leq 4$
EVI Score = 2 $4 < X \leq 4.5$
EVI Score = 3 $4.5 < X \leq 5$
EVI Score = 4 $5 < X \leq 5.5$
EVI Score = 5 $5.5 < X \leq 6$
EVI Score = 6 $6 < X \leq 6.5$
EVI Score = 7 $6.5 < X$

Rationale Vulnerability to drought, dry spells, stress on surface water resources. This indicator captures not only the number of months with significantly lower rainfall, but also the strength of the deficit. Two countries could have the same average number of months over the past 5 years with less than 20% lower than the monthly average rainfall, with one only having a small deficit, while another a very large one. This indicator ensures that the amount of rain 'missed' is captured. Frequent and severe drought months could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. fires, water movements, ability of ecosystems to attenuate pollution).

Indicator WET **Collection** EVI 2004

Indicator # 158 **Sub-Index**

Indicator Name Wet periods

Units Millimetres of excess rainfall. Total excess rainfall in mm over the past 5 years, averaged over all stations and months for which there were data. In their final form results are expressed as annual excess.

Reference Year 1999-2003 for most countries. Other data from 1965, 1966, 1976.

Source NOAA GHCN http://www.ncdc.noaa.gov/oa/pub/data/ghcn/v2/ghcnftp_zipd.html; In-country

Additional Sources:

Cook Islands - Meteorology Office. Nga Rauraa (+682 20603/ 682 21603); Federated States of Micronesia - NOAA/ NCDC – 1999 Local Climate Data/ NCDC. Caesar Hadley. WSO Pohnpei – NWSPR/ NOAA; Fiji - Ashmita Gosai (+679-724888); Greece - Dr Paula Scott (ph&f: +30-81-861219, cariad@her.forthnet.gr); Kiribati - Kirion Kabunateiti. Climate Archive from Kiribati Meteorology Services (KMS); Marshall Islands - NOAA NCDC Ashville. Local Climatological Data (LCD). Lee Z Jacklick; Nauru - Nauru Meteorology Services. Frank W Davey; Nepal - Various issues of Climatological records of Nepal. Soroj Kumar Baidhya (MR) Phone +641 255920; New Zealand - National Institute of Water and Atmospheric Research, New Zealand. Mr A. C Penney. E.Mail: a.penney@niwa.cri.nz ; Niue - Sionetasi Pulehetoa. Meteorology Department
Palau - Maria Ngemaes (680 4881034, maria.ngemaes@noaa.gov) Weather Service Office (National Weather Service); Papua New Guinea - Climatic Tables for PNG. McAlphine, J. R.; Keig, G.; and Short, K. PNG National Weather Service; Philippines - Climatological Normals. Ms Panfila E. Gica / Climate Data Section / PAGASA
Samoa - Niko Tualevao. Apia Observatory/ Samoa Meteorology; Singapore - Mr Wong Teo Suan ++(65) 5457191 ++(65) 5457192. Meteorological office Singapore; Thailand - Climatology Division Meteorological Department 21 Aug 2001 local_climate@tmdnet.motc.go.th ; Tonga - Ofa Fa'anunu (676 23401/ 24145/ Tongamet@kalianet.to) Climate Archive, Tonga Meteorology Services (TMS); Trinidad & Tobago - Debbie Ramnarine; Tuvalu - Tuvalu Meteorology Services (TMS). Hilia Vavae; Vanuatu - Vanuatu Meteorology Services (VMS). Mr Kaniaha Salesa (678 23866/ 22310/ climate@meteo.vu).

Methodology Average annual excess rainfall (mm) over the past 5 years for all months with >20% higher rainfall than the 30 year monthly average, averaged over all reference climate stations.

1.This indicator is focused on the size of the rainfall excess across all climate stations in countries, so takes into account vastly different climates (assessing excess only in terms of one climate station at a time and then averaging them across stations).

2. Contiguous months of high rainfall are not captured separately from isolated months. Effects are likely to be worse for areas in which the excess is sustained.

3. We upgraded the indicator from a simpler form to measure the strength of the excess, if one exists. This gives a better picture of vulnerability because it separates 'minor' excesses from severe ones.

4. Dividing the total excess by the number of climate stations is necessary to prevent apparently excessive rainfall caused because data are being collected from different numbers of stations in countries. That means that in large countries with many stations, severe excessive rainfall at one or a small number of stations may be lost by averaging over a very large number of stations with normal rainfall. We consider this appropriate since the averaging over many stations puts damage into the context of the entire area likely to be affected.

Further information on this variable is available from the EVI Progress Report 2004, pp. 25-31.

Rationale Vulnerability to floods, cyclones, wet periods, stress on land surfaces and ecosystems subject to flooding and disturbance. This indicator captures not only the number of months with significantly higher rainfall, but also the amount of the excess. Two countries could have the same number of months of the past 60 (5 years) with more than 20% higher rainfall than the monthly average, with one only having a small excess, while another a very large one. The modification to this indicator ensures that the amount of rain 'in excess' is captured. Frequent and severe wet months could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. water movements, the spread of and ability of ecosystems to attenuate pollution).

Indicator WETEVI **Collection** EVI 2004

Indicator # 159 **Sub-Index**

Indicator Name Wet periods (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable WET, which is measured in as the square root of the number of wet spells between 1999 and 2003, the authors applied the following break off values:

EVI Score = 1 $X \leq 5$
EVI Score = 2 $5 < X \leq 7$
EVI Score = 3 $7 < X \leq 9$
EVI Score = 4 $9 < X \leq 11$
EVI Score = 5 $11 < X \leq 13$
EVI Score = 6 $13 < X \leq 15$
EVI Score = 7 $15 < X$

Rationale Vulnerability to floods, cyclones, wet periods, stress on land surfaces and ecosystems subject to flooding and disturbance. This indicator captures not only the number of months with significantly higher rainfall, but also the amount of the excess. Two countries could have the same number of months of the past 60 (5 years) with more than 20% higher rainfall than the monthly average, with one only having a small excess, while another a very large one. The modification to this indicator ensures that the amount of rain 'in excess' is captured. Frequent and severe wet months could indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. water movements, the spread of and ability of ecosystems to attenuate pollution).

Indicator HOT **Collection** EVI 2004

Indicator # 160 **Sub-Index**

Indicator Name Hot Periods

Units Total degrees (Farenheit) of excess heat per year. Annual averages over the past 5 years of summed deviations of daily maximum temperatures that are more than 9F higher than the 30 year monthly mean maximum temperatures, calculated for each climate station in a country and then averaged over all climate stations.

Reference Year 1999-2003

Source NOAA DATSAV3 Surface SOD 1973-2003. National Climatic Data Centre, 151 Patton Avenue, Asheville, NC 28801-5001

Additional Sources:

Cook Islands - Meteorology Office. Nga Rauraa (+682 20603/ 682 21603); Federated States of Micronesia - NOAA/ NCDC – 1999 Local Climate Data/ NCDC. Caesar Hadley. WSO Pohnpei – NWSPR/ NOAA; Fiji - Ashmita Gosai (+679-724888); Greece - Dr Paula Scott (ph&f: +30-81-861219, cariad@her.forthnet.gr); Kiribati - Kirion Kabunateiti. Climate Archive from Kiribati Meteorology Services (KMS); Marshall Islands - NOAA NCDC Ashville. Local Climatological Data (LCD). Lee Z Jacklick; Nauru - Nauru Meteorology Services. Frank W Davey; Nepal - Various issues of Climatological records of Nepal. Soroj Kumar Baidhya (MR) Phone +641 255920; New Zealand - National Institute of Water and Atmospheric Research, New Zealand. Mr A. C Penney. E.Mail: a.penney@niwa.cri.nz ; Niue - Sionetasi Pulehetoa. Meteorology Department
Palau - Maria Ngemaes (680 4881034, maria.ngemaes@noaa.gov) Weather Service Office (National Weather Service); Papua New Guinea - Climatic Tables for PNG. McAlphine, J. R.; Keig, G.; and Short, K. PNG National Weather Service; Philippines - Climatological Normals. Ms Panfila E. Gica / Climate Data Section / PAGASA
Samoa - Niko Tualevao. Apia Observatory/ Samoa Meteorology; Singapore - Mr Wong Teo Suan ++(65) 5457191 ++(65) 5457192. Meteorological office Singapore; Thailand - Climatology Division Meteorological Department 21 Aug 2001 local_climate@tmdnet.motc.go.th ; Tonga - Ofa Fa'anunu (676 23401/ 24145/ Tongamet@kalianet.to) Climate Archive, Tonga Meteorology Services (TMS); Trinidad & Tobago - Debbie Ramnarine; Tuvalu - Tuvalu Meteorology Services (TMS). Hilia Vavae; Vanuatu - Vanuatu Meteorology Services (VMS). Mr Kaniaha Salesa (678 23866/ 22310/ climate@meteo.vu).

Methodology Average annual excess heat (degrees Farenheit) over the past 5 years for all days more than 9F (5°C) hotter than the 30 year mean monthly maximum, averaged over all reference climate stations.

Raw values were supplied in Farenheit, so calculations have been made in those units, with the threshold at 9F used for measuring deviations.

Raw values of summed deviations were adjusted for each individual climate station to account for missing days of data. This was done by multiplying the summed deviations across days with more than 5˚C (9˚F) higher daily maximum temperature, by the total number of days in the 5 year period (1826 days) and dividing by the number of days for which that station had data (many stations have missing days) = [(Deviations * 1826) / days with data]. The adjustment was done to ensure stations with fewer days of data were comparable with those which had more.

In its original form, this indicator called for data on the number of days with >5C higher daily maximum temperatures over the 30-year monthly mean. We adjusted the indicator to sum all the deviations above the threshold so that countries with only slight excess could be distinguished from those with large ones.

Rationale Vulnerability to heat waves, desertification, water resources, temperature stress, bleaching. This indicator is designed to capture stress on land surfaces and nearshore or shallow aquatic environments to periods of high temperatures that can affect productivity, oxygen levels, pollution, reproduction and symbiotic relationships and lead to mass mortality. On land, periods of high temperatures can also lead to interactive effects such as fires. This indicator captures not only the number of days with significantly higher temperatures, but also the amount of the excess. Two countries could have the same number of days with more than 5ºC higher temperatures than the monthly average, with one only having a small excess, while another a very large one. Frequent and severe hot days could also indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. ability of forests to regenerate if disturbed).

Indicator HOTEVI **Collection** EVI 2004

Indicator # 161 **Sub-Index**

Indicator Name Hot Periods (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable HOTPER, measured in the natural log of the total degrees (Farenheit) of excess heat per year, the authors applied the following break off values:

EVI Score = 1 $X \leq 3.5$
EVI Score = 2 $3.5 < X \leq 4$
EVI Score = 3 $4 < X \leq 4.5$
EVI Score = 4 $4.5 < X \leq 5$
EVI Score = 5 $5 < X \leq 5.5$
EVI Score = 6 $5.5 < X \leq 6$
EVI Score = 7 $6 < X$

Rationale Vulnerability to heat waves, desertification, water resources, temperature stress, bleaching. This indicator is designed to capture stress on land surfaces and nearshore or shallow aquatic environments to periods of high temperatures that can affect productivity, oxygen levels, pollution, reproduction and symbiotic relationships and lead to mass mortality. On land, periods of high temperatures can also lead to interactive effects such as fires. This indicator captures not only the number of days with significantly higher temperatures, but also the amount of the excess. Two countries could have the same number of days with more than 5ºC higher temperatures than the monthly average, with one only having a small excess, while another a very large one. Frequent and severe hot days could also indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. ability of forests to regenerate if disturbed).

Indicator COLD **Collection** EVI 2004

Indicator # 162 **Sub-Index**

Indicator Name Cold Periods

Units Total degrees (Farenheit) of heat deficit per year. These are as annual averages over the past 5 years of summed deviations of daily minimum temperatures that are more than 9F lower than the 30 year by month, mean daily minimum temperatures, calculated for each climate station in a country and then averaged over all climate stations.

Reference Year 1999-2003

Source NOAA DATSAV3 Surface SOD 1973-2003. National Climatic Data Centre, 151 Patton Avenue, Asheville, NC 28801-5001.

Additional Sources:

Cook Islands - Meteorology Office. Nga Rauraa (+682 20603/ 682 21603); Federated States of Micronesia - NOAA/ NCDC – 1999 Local Climate Data/ NCDC. Caesar Hadley. WSO Pohnpei – NWSPR/ NOAA; Fiji - Ashmita Gosai (+679-724888); Greece - Dr Paula Scott (ph&f: +30-81-861219, cariad@her.forthnet.gr); Kiribati - Kirion Kabunateiti. Climate Archive from Kiribati Meteorology Services (KMS); Marshall Islands - NOAA NCDC Ashville. Local Climatological Data (LCD). Lee Z Jacklick; Nauru - Nauru Meteorology Services. Frank W Davey; Nepal - Various issues of Climatological records of Nepal. Soroj Kumar Baidhya (MR) Phone +641 255920; New Zealand - National Institute of Water and Atmospheric Research, New Zealand. Mr A. C Penney. E.Mail: a.penney@niwa.cri.nz ; Niue - Sionetasi Pulehetoa. Meteorology Department
Palau - Maria Ngemaes (680 4881034, maria.ngemaes@noaa.gov) Weather Service Office (National Weather Service); Papua New Guinea - Climatic Tables for PNG. McAlphine, J. R.; Keig, G.; and Short, K. PNG National Weather Service; Philippines - Climatological Normals. Ms Panfila E. Gica / Climate Data Section / PAGASA
Samoa - Niko Tualevao. Apia Observatory/ Samoa Meteorology; Singapore - Mr Wong Teo Suan ++(65) 5457191 ++(65) 5457192. Meteorological office Singapore; Thailand - Climatology Division Meteorological Department 21 Aug 2001 local_climate@tmdnet.motc.go.th ; Tonga - Ofa Fa'anunu (676 23401/ 24145/ Tongamet@kalianet.to) Climate Archive, Tonga Meteorology Services (TMS); Trinidad & Tobago - Debbie Ramnarine; Tuvalu - Tuvalu Meteorology Services (TMS). Hilia Vavae; Vanuatu - Vanuatu Meteorology Services (VMS). Mr Kaniaha Salesa (678 23866/ 22310/ climate@meteo.vu).

Methodology Average annual heat deficit (degrees) over the past 5 years for all days more than 5°C cooler than the 30 year mean monthly minimum, averaged over all reference climate stations.

Raw values were supplied in Farenheit, so calculations have been made in those units, with the threshold at 9F used for measuring deviations.

Raw values of summed deviations were adjusted for each individual climate station to account for missing days of data. This was done by multiplying the summed deviations across days with more than 5˚C (9˚F) lower daily minimum temperature, by the total number of days in the 5 year period (1826 days) and dividing by the number of days for which that station had data (many stations have missing days) = [(Deviations * 1826) / days with data]. The adjustment was done to ensure stations with fewer days of data were comparable with those which had more.

In its original form, this indicator called for data on the number of days with >5C lower daily minimum temperatures over the 30-year monthly mean. We adjusted the indicator to sum all the deviations above the threshold so that countries with only slight excess could be distinguished from those with large ones.

Rationale Vulnerability to cold snaps, unusual frosts, effects on water resources, temperature stress, pollution attenuation rates, reproductive success. This indicator is designed to capture stress on land surfaces and nearshore or shallow aquatic environments to periods of low temperatures that can affect productivity, oxygen levels, pollution, reproduction and symbiotic relationships and lead to mass mortality. This indicator captures not only the number of days with significantly lower temperatures, but also the amount of the "heat deficit". Two countries could have the same number of days with more than 5ºC lower temperatures than the monthly average, with one only having a small deficit, while another a very large one. Frequent and severe cold days could also indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. ability of lakes and rivers to attenuate pollutants).

Indicator	COLDEVI	**Collection**	EVI 2004
Indicator #	163	**Sub-Index**	

Indicator Name Cold Periods (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable COLDPER, the authors applied the following break off values (where X is the natural log of the total degrees (Farenheit) of heat deficit per year):

EVI Score = 1 $X \leq 3.5$
EVI Score = 2 $3.5 < X \leq 4$
EVI Score = 3 $4 < X \leq 4.5$
EVI Score = 4 $4.5 < X \leq 5$
EVI Score = 5 $5 < X \leq 5.5$
EVI Score = 6 $5.5 < X \leq 6$
EVI Score = 7 $6 < X$

Rationale Vulnerability to cold snaps, unusual frosts, effects on water resources, temperature stress, pollution attenuation rates, reproductive success. This indicator is designed to capture stress on land surfaces and nearshore or shallow aquatic environments to periods of low temperatures that can affect productivity, oxygen levels, pollution, reproduction and symbiotic relationships and lead to mass mortality. This indicator captures not only the number of days with significantly lower temperatures, but also the amount of the "heat deficit". Two countries could have the same number of days with more than 5ºC lower temperatures than the monthly average, with one only having a small deficit, while another a very large one. Frequent and severe cold days could also indicate shifts in weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. ability of lakes and rivers to attenuate pollutants).

Indicator	SST	**Collection**	EVI 2004
Indicator #	164	**Sub-Index**	

Indicator Name Sea Temperatures

Units Absolute values of temperature anomalies in relation to the 30 year monthly (1961-1990) averages in degrees C

Reference Year 1999-2003

Source 1.Climatic Research Unit, University of East Anglia, Norwich, UK.
http://www.cru.uea.ac.uk/cru/data/temperature/#datdow
2. Data masked and extracted for EEZs by University of British Columbia

Additional sources:

www.pmel.noaa.gov/pmel (Papua New Guinea); www.seafdec.org/inform/survey.htm (24/05/01) (Thailand); www.start.or.th/got/data/dblink.html (21/05/01); Fiji - Simon McGree. Fiji Meteorological Service; Kiribati - Smith & Reynolds 1998 (61-90); Nauru - Climate Change Response. Nauru's National Committee on Climate Change & SOPAC's Energy Unit. 1999; New Zealand - M.J Uddstrom and N.A. Oien, 1999, On the use of high resolution satellite data to describe the spatial and temporal variability of SSTS's in the New Zealand Region, JGR, 104 (cq) 20729 – 20751; Palau - Coral Reef Research Foundation; Philippines - Monthly mean and annual climatic Data Dry Bulb temperature. Data collected by Panfila. Gica. Climate Data Section/ Philippine Atmospheric, Geophysical and Astronomical Services Administration;

Trinidad & Tobago - Della Harripaul.

Methodology Average annual deviation in Sea Surface Temperatures (SST) in the last 5 years in relation to the 30 year monthly means (1961-1990).

1. Where countries had data for two or more regions or seas, we calculated average anomalies separately and then averaged them across seas (e.g. Japan, Germany, USA, Turkey)

2. This indicator was considered generally not applicable (NA) to land-locked countries

3. Three countries considered land-locked by UNCTAD and Wikipedia (Azerbaijan, Kazakhstan and Turkmenistan) had data from their associated seas. The available data were used, so an EVI score is available for those countries.

Rationale This indicator captures vulnerability to fluctuations in productivity, fisheries, currents, eddies, ENSO, cyclones & storms, blooms and coral bleaching. The indicator captures the total amount of the anomalies in SST, either as excess or deficit (using absolute values). Frequent and severe deviations from the 30 year moving average could herald shifts in currents, upwelling, weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. for water movements, the spread of and ability of ecosystems to attenuate pollution). Effects would be especially important when other stresses have already driven populations to low levels.

Indicator SSTEVI **Collection** EVI 2004

Indicator # 165 **Sub-Index**

Indicator Name Sea Temperatures (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2003

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable SEATEMP, the authors applied the following break off values (where X is Absolute values of temperature anomalies in relation to the 30 year monthly (1961-1990) averages in degrees C):

EVI Score = 1 $X \leq 0.5$
EVI Score = 2 $0.5 < X \leq 0.75$
EVI Score = 3 $0.75 < X \leq 1.0$
EVI Score = 4 $1.0 < X \leq 1.25$
EVI Score = 5 $1.25 < X \leq 1.5$
EVI Score = 6 $1.5 < X \leq 1.75$
EVI Score = 7 $1.75 < X$

Rationale This indicator captures vulnerability to fluctuations in productivity, fisheries, currents, eddies, ENSO, cyclones & storms, blooms and coral bleaching. The indicator captures the total amount of the anomalies in SST, either as excess or deficit (using absolute values). Frequent and severe deviations from the 30 year moving average could herald shifts in currents, upwelling, weather patterns and climate, and could negatively affect a country's resilience to other hazards (e.g. for water movements, the spread of and ability of ecosystems to attenuate pollution). Effects would be especially important when other stresses have already driven populations to low levels.

Indicator	VOLCANO	**Collection**	EVI 2004
Indicator #	166	**Sub-Index**	

Indicator Name Cumulative Volcano Risk

Units Cumulative volcano risk (CumVEI) as the weighted number of volcanoes with the potential for eruption greater than or equal to a Volcanic Explosively Index (VEI) of 2 within 100km of the country land boundary, divided by the area of land.

Reference Year 2004

Source NOAA / NESDIS / National Geophysical Data Centre / World Data Centre-A / Colorado USA; In-country

Additional sources:

www.ngdc.noaa.gov/cgi-bin/seg/haz/ffq_result.pl (24/08/01); Cook Islands - Roro Taia. Cook Islands Meteorological Services. (CIMS); Cooke & Ravian. 1981. Volume of volcanological papers. Edited by Jonson, R W. Geological Survey of PNG Memoir 10; Kiribati - Ministry of Natural Resources & Development (MNRD). Naomi Atauea (686 21099/ 686 21120); Nauru - Department of Island Development and Industry. Davey Agadio; New Zealand - Volcanic hazard information series 1-8: Ministry of civil defence/ ministry of energy management. Dr Brent Alloway. Ph: +64 73760160, Fax +64 73748199. E-Mail b.alloway@gns.cri.nz ; Philippines - Dr. Ernesto Corpus / Chief, Volcanology Monitoring, Eruption and Prediction Division, Philippine Institute of Volcanology (PHILVOCS); Samoa - Meteorology Division. L. Talia, PO Box 3020, Apia, Samoa; Thailand - The Royal Thai Survey Department. Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com ; Tonga - A Volcanic Hazards Assesment Following the January 1999 Eruption of Sb-marine Volcano III Tofua Volcanic Arc, Kingdom of Tonga. 1999. Paul W Taylor, Australian Volcanological Investigations, PO Box 291, NSW, Australia; Tuvalu - Department of Lands and Surveys. Tesimita Ailesi; Vanuatu - Department of Geology, Mines & Water Resources.

Methodology Volcano Explosively Index (VEI) is a 0-8 scale based on observations (e.g. description, plume height, volume, classification, and frequency of eruptions). Volcanic activity of this scale has the potential to cause significant changes in the environment, loss of ecosystems and biodiversity. Reference for the VEI scale can be found at website: http://volcano.und.nodak.edu/vwdocs/eruption_scale.html.

1. The indicator is calculated as CumVEI = (VEI2*2) + (VEI3*3) + (VEI4*4) + (VEI5*5) + (VEI6*6) + (VEI7*7) + (VEI8*8)

2. This indicator is focused on disturbance. At Think Tank I, it was determined that a country that has volcanoes with a high VEI is susceptible to having large areas damaged by explosive eruptions, which though may not be common, can have geographically far-reaching effects for long periods of time.

3. At Think Tank II, the modified to include all volcanoes of VEI 2+. Volcanoes that erupt periodically and smoke over a long period of time may be just as destructive to the environment as the largest cataclysmic eruptions. Total number of live volcanoes (TNLV) or cumulative VEI may be better indicators for the EVI.

4. The concept of VEI has been criticised because it is largely based on the observed behaviour of a volcano during witnessed eruptions and is keyed-in to the effects of eruptions on humans. For the purposes of the EVI, we are more interested in effects on the environment as life-support to humans.

Rationale Vulnerability to Eruptions, landslides, geysers, gas (e.g. SO2 and CO2), fires, ash, dust, marine kills, biodiversity of habitat & species, potential for repeated and long term habitat disturbance. This indicator captures the risk of damage to ecosystems from the physical,

chemical and biological disturbances associated with volcanic eruptions. Because the risk associated with volcanoes varies according to size and type, the signal incorporates the number of volcanoes capable of affecting a country, and its potential for damage.

Indicator	VOLCANOEVI	**Collection**	EVI 2004
Indicator #	167	**Sub-Index**	
Indicator Name	Cumulative Volcano Risk (scaled)		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2004		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	Using the variable VOLCANO, the authors applied the following break off values (where X is the cumulative volcano risk (CumVEI) as the weighted number of volcanoes with the potential for eruption greater than or equal to a Volcanic Explosively Index (VEI) of 2 within 100km of the country land boundary, divided by the area of land): EVI Score = 1 $X \leq 2$ EVI Score = 2 $2 < X \leq 3$ EVI Score = 3 $3 < X \leq 4$ EVI Score = 4 $4 < X \leq 5$ EVI Score = 5 $5 < X \leq 6$ EVI Score = 6 $6 < X \leq 7$ EVI Score = 7 $7 < X$		
Rationale	Vulnerability to Eruptions, landslides, geysers, gas (e.g. SO2 and CO2), fires, ash, dust, marine kills, biodiversity of habitat & species, potential for repeated and long term habitat disturbance. This indicator captures the risk of damage to ecosystems from the physical, chemical and biological disturbances associated with volcanic eruptions. Because the risk associated with volcanoes varies according to size and type, the signal incorporates the number of volcanoes capable of affecting a country, and its potential for damage.		

Indicator	EARTHQK	**Collection**	EVI 2004
Indicator #	168	**Sub-Index**	
Indicator Name	Cumulative Earthquake Energy		
Units	Number of earthquakes (ML ≥ 6, Depth ≤ 15 km)		
Reference Year	2004		
Source	NOAA/NESDIS/NGCC/World Data Centre-A, Colorado Additional sources: www.ngdc.noaa.gov/seg/hazard/sig_srch.shtml (2/03/99); Botswana - Dept of Geological survey. Mr Hendrick Holmes, ph.336770: E-mail hholmes@gov.bw ; Botswana - Ngwisanyi. T, Kwadiba. M. 1999 Catalogue of earthquakes in Botswana from 1950- 1991; a 1999 internal Report of the Department of Geological Survey; Cook Islands - Roro Taia. Cook Islands Meteorological Services. (CIMS); Fiji - Raw data sheets on Earthquakes. Minerals Resource Department. Arvin Singh (381611); Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Ministry of Natural Resources Development. Naomi Atauea (686 21099/ 686 21120); Kyrgyzstan - Institute of Seismology, National Academy of Sciences. Mr. Djanuzakov; Nepal - Society for Environment and Development. Damodar Adhikari,		

Phone/Fax +1 499700, dadhikar@wlink.com.np ; New Zealand - http/www.seismology.Harvard. edu/cmtsearch.html; Papua New Guinea - Geophysical Observatory Earthquake Database. PNG Geological Survey; Philippines - Earthquake Catalogue PHILVOCS Annual Report. Mr. BARTOLOME C. BAUTISTA / Chief, Seismology Observation and Earthquake Prediction Division / PHILVOCS; Samoa - Geophysics Section (Meteorology Division). L. Talia, PO Box 3020, Apia, Samoa. Apia Observatory; Thailand - http://tmd.motc.go.th/quake/e-stat.html (6/6/01); Vanuatu - National Earthquake Information Center, USGS. Jean Philippe Caminade.

Methodology Cumulative earthquake energy within 100km of country land boundaries measured as Local Magnitude (ML) ≥ 6.0 and occurring at a depth of less than or equal to fifteen kilometres (≤15km depth) over 5 years (divided by land area)

1. Deeper earthquakes are considered to present less risk to the environment. It is considered that shallow earthquakes of depths less that 15 km are likely to cause the most significant environmental changes and have the most impacts on the overlying environments.

2. The indicator may also function as a proxy for habitat disturbance through avalanches, slides and rifts and could damage structures of ecological significance (e.g. aquifers).

Rationale Vulnerability to habitat disturbance through movements of land, water and slides. This indicator captures the risks of damage to the environment from large-scale disturbances such as fluidisation of soils and muds, diversion of rivers and other water bodies, tsunamis, slides, and direct damage to organisms associated with earth movements.

Indicator EARTHQKEVI **Collection** EVI 2004

Indicator # 169 **Sub-Index**

Indicator Name Cumulative Earthquake Energy (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable EARTHQK, the authors applied the following break off values (where X = Number of earthquakes (ML ≥ 6, Depth ≤ 15 km)):

EVI Score = 1 $0 \leq X < 1$
EVI Score = 2 $1 \leq X < 2$
EVI Score = 3 $2 \leq X < 3$
EVI Score = 4 $3 \leq X < 4$
EVI Score = 5 $4 \leq X < 5$
EVI Score = 6 $5 \leq X < 6$

Rationale Vulnerability to habitat disturbance through movements of land, water and slides. This indicator captures the risks of damage to the environment from large-scale disturbances such as fluidisation of soils and muds, diversion of rivers and other water bodies, tsunamis, slides, and direct damage to organisms associated with earth movements.

Indicator	TSUNAMI	**Collection**	EVI 2004
Indicator #	170	**Sub-Index**	

Indicator Name Tsunami Density

Units Number of tsunamis with run-up >2m above MHWS (years 1900-2000) / length of coastlines (maritime) * 1000

Reference Year 2004

Source Tsunamis: NOAA/NESDIS/NGCC
Land area and length maritime coast from WRI 2000-2001 and CIA 2001

Additional sources:

www.start.or.th/got/data/dblink.htm (Thailand); www.ngdc.noaa.gov/cgi-bin/seg/haz/ffq_result.pl (24/08/01); Federated States of Micronesia - Michael Gawel. 1993 Federated States of Micronesia State of Environment Report. (pp34); Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Niue - Forbes, TR 233 Coastal Geology and Hazards in Niue; Papua New Guinea - Moihoi, M and Anton, L. 1999. Significant Tsunamis in PNG (A Review); Philippines - National Disaster Coordinating Council (NDCC) administrative reports. Mr. Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph ; Tuvalu - New Zealand Meteorology Service (Kerr; p 103 – 104); Vanuatu - DESS of Sandrine Wallez. Vanuatu ORSTOM & National Disaster Management Office (NDMO) & Co.

Methodology Number of tsunamis or storms surges with run-up greater than 2 metres above Mean High Water Spring tide (MHWS) per 1000 km coastline since 1900.

1. Indicator is tested raw, in relation to length of coastline and in relation to land area of each country.

2. The tsunamis per length of coast is better multiplied by 1000 to create a range that extends between zero and whole numbers up to 25. For tsunamis per area of land, the multiplier used was 1 million.

3. Because these are geological events, the time series covers the period since 1900. The figure calculated may change through additional tsunami events being recorded in a country.

4. Only tsunamis with a run-up of >2m are included. Those smaller are considered of minimal threat to coastal systems, and are expected to have an impact within the range of more common storms.

5. For landlocked countries the risk of tsunamis is considered zero and the data designation NA (not applicable) is used. In terms of EVI scaling, landlocked countries are scored the lowest EVI value (1) unless it can be shown that the shorelines and coastal areas of large lakes have been the subject of tsunami-like events, in which case they would record values like any other country.

Rationale This indicator captures the potential loss of shorelines, coastal ecosystems and resources, and loss of species due to catastrophic run up of seawater onto coastal lands. Countries with frequent and severe tsunamis are at risk of severe or permanent damage to biodiversity, productivity and the ability to recover from other stressors.

Indicator	TSUNAMIEVI	**Collection**	EVI 2004
Indicator #	171	**Sub-Index**	

Indicator Name Tsunami Density (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable TSUNAMI, the authors applied the following break off values (where X = Number of tsunamis with run-up >2m above MHWS (years 1900-2000) / length of coastlines (maritime) * 1000):

EVI Score = 1 X = 0, or NA
EVI Score = 2 $0 < X \leq 1$
EVI Score = 3 $1 < X \leq 2$
EVI Score = 4 $2 < X \leq 5$
EVI Score = 5 $5 < X \leq 10$
EVI Score = 6 $10 < X \leq 15$
EVI Score = 7 $X > 15$

Rationale This indicator captures the potential loss of shorelines, coastal ecosystems and resources, and loss of species due to catastrophic run up of seawater onto coastal lands. Countries with frequent and severe tsunamis are at risk of severe or permanent damage to biodiversity, productivity and the ability to recover from other stressors.

Indicator	SLIDES	**Collection**	EVI 2004
Indicator #	172	**Sub-Index**	

Indicator Name Land Slides

Units Number of slides recorded between 1996-2000, divided by area of land (km2).

Reference Year 1996-2000

Source EMDAT OFDA/CRED International Disaster Database 2001

Additional sources:

Encarta 2000 Maps; Botswana - Contact - Sarah E. A. Kabaija (Mrs)267 – 352200 Phone267 – 352201 Faxskabaija@gov.bw . Principal StatisticianHead of environment Statistics. Central Statistics Office; Costa Rica - Comision nacional de emergencia 2002; Fiji - Media (Fiji TV, Fiji Times) EVI Team; Kiribati - Contact - Ms Naomi Atauea. Mineral Unit/Ministry of Natural Resources and Development.

Methodology Number of slides recorded in the last 5 years (see EMDAT definitions), divided by land area.

Number of slides (landslides, mudslides and avalanches) lasting more than 30 seconds recorded over the past 5 years, divided by the area of mountainous lands. Mountainous lands are any over 1000m above sea level.

1. It may be possible to obtain data for this indicator from seismological records. Landslides may be part of the background noise in seismological records taken continuously.

2. The effects of slides are likely to be relatively localised (though they may mobilize runoff and mudflows which could travel down water courses and into the sea).

3. Data on slides included the following categories for inclusion: 10 or More people killed; 100 or more people affected; Significant disaster; Significant damage; Declaration of state of emergency or/and appeal for an international assistance; Disaster entered at the country level without data, because it has affected several countries/region.

Rationale This indicator captures the risk of habitat disturbance and persistence of ecosystems and species from catastrophic shifts in the land surface. The primary and cumulative effects of slides would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator SLIDESEVI **Collection** EVI 2004

Indicator # 173 **Sub-Index**

Indicator Name Land Slides (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable SLIDES, the authors applied the following break off values (where X = natural log of the number of slides recorded between 1996-2000, divided by area of land):

EVI Score = 1 $X = 0$
EVI Score = 2 $0 < X \leq 0.5$
EVI Score = 3 $0.5 < X \leq 1$
EVI Score = 4 $1 < X \leq 1.5$
EVI Score = 5 $1.5 < X \leq 2$
EVI Score = 6 $2 < X \leq 2.5$
EVI Score = 7 $2.5 < X$

Rationale This indicator captures the risk of habitat disturbance and persistence of ecosystems and species from catastrophic shifts in the land surface. The primary and cumulative effects of slides would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator LAND **Collection** EVI 2004

Indicator # 174 **Sub-Index**

Indicator Name Land Area

Units Total land area (accumulated across islands, if present in square kilometers)

Reference Year 2003

Source WRI 2000-2001, CIA Fact sheets 2001

Additional sources:

www.bartleby.com/151/a6.html (20/02/2002); www.linz.govt.nz/rcs/linz/pub/web /root/home/index.jsp (New Zealand); Cook Islands - Cook Islands NEMS (National Environmental Management Strategy) Report. SPREP (South Pacific Regional Environment Programme); Greece - Greece Govt Information. Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Internal record (Digitized 1:25000 Paper Maps), Ordinance Surveys, UK. Land Management Division (LMD); Marshall Islands - Land in Micronesia & its

Resources: An Annotated Bibliography/ E. H. Bryan, Jr. 1971; Nauru - Thaman, R R and Hassall, D C. 1999. Nauru National Environmental Management Strategy (NEMS); Niue - Niue National Environmental Management Strategy (NEMS) Report. SPREP, UNDP; Palau - Various maps. Bureau of Land Survey. Contact - Jerry Knight (680 4882332/ 4883195/ bls@palaunet.com); Philippines - Philippine Forestry Statistics. Ms MAYUMI Ma. QUINTOS / Chief, Forest Economics Division / Forest Management Bureau (FMB); Samoa - State of Environment Report: Samoa, Government of Samoa. 1998. Tu'u'uleti Taulealo, National Environmental Management Strategy (NEMS) Consultant; Thailand - National Geography Committee. (1984) Series Document of Thailand Geography volume 1: Physical Characteristic of Thailand ISBN 974-07-5303-5; Tonga - www.spc.org.nc/demog/pop_data200.html ; Tuvalu - Tuvalu National Environmental Management Strategy (NEMS) Report; WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resources Institute, UNDP, UNEP, World Bank. Washington, D.C.

Methodology Area of land is calculated from MHWM (mean high water on maritime coasts). Estimates differ among sources and are subject to errors depending on the scale of maps used and the definition of where land begins in relation to sea-level. These differences are not considered of significance.

Rationale This indicator captures the richness of habitat types and diversity, availability of refugia if damage is sustained or for protection, and species and habitat redundancy. It is generally considered that larger countries will have more options and the 'critical mass' required for ecological systems to persist and re-seed each other in the face of ecosystem stressors. There will also be more options for the human populations to allow areas that have been damaged to recover.

Indicator LANDEVI **Collection** EVI 2004

Indicator # 175 **Sub-Index**

Indicator Name Land Area (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable LANDAR, the authors applied the following break off values (where X = natural log of the area of land):

EVI Score = 1 $X > 14$
EVI Score = 2 $12 < X \leq 14$
EVI Score = 3 $10 < X \leq 12$
EVI Score = 4 $8 < X \leq 10$
EVI Score = 5 $6 < X \leq 8$
EVI Score = 6 $4 < X \leq 6$
EVI Score = 7 $X < 4$

Rationale This indicator captures the richness of habitat types and diversity, availability of refugia if damage is sustained or for protection, and species and habitat redundancy. It is generally considered that larger countries will have more options and the 'critical mass' required for ecological systems to persist and re-seed each other in the face of ecosystem stressors. There will also be more options for the human populations to allow areas that have been damaged to recover.

Indicator	DISP	**Collection**	EVI 2004
Indicator #	176	**Sub-Index**	

Indicator Name Country Dispersion

Units Total length of land and sea borders (km) / land area of country (accumulated across islands, if present) (1000 sq km).

Reference Year 2004

Source WRI 2000-2001, CIA Fact sheets 2001

Additional sources:

www.bartleby.com/151/a9.html (26-02-2002); WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute, UNDP, UNEP, World Bank,. Washington, D.C.; Bangladesh - Bangladesh State of the Environment Report. 1999; Cook Islands - Marine Resources. Works, Energy and Physical Planning (MOWEPP). Timoti Tangiruaine (682 24484/ 682 21134); Kiribati - Internal record (Digitised 1:25000 Paper Maps), Ordinance Surveys, UK. Land Management Division (LMD); Nauru - Lands & Survey. Contact - Porthos Bop (674 4443845); New Zealand - http://www.linz.govt.nz/rcs/linz/pub/web /root/home/index.jsp ; Niue - GIS – Coastal layer. Lands & Survey. Contact - Coral Pasisi (Fax: 683 4231/ coral.ca@mail.gov.nu); Palau - Various maps. Bureau of Land Surveys. Contact - Jerry Knight (680 4882332/ 4883195/ bls@palaunet.com); Samoa - W. Samoa, EEZ Report, Mapping, DLSE. FFA Publcation. Boyes, G and Leo, O.; Tuvalu - Tuvalu Maps. Government of the United Kingdom and D.O.S. Department of Lands and Survey.

Methodology Ratio of length of borders (land and maritime) to total land area

1. Indicator is tested raw.
2. The degree of dispersion of countries may prove to be correlated with overall land area.
3. Length of borders includes all land and coastlines.

Rationale This indicator captures the degree to which a country's land area is fragmented and 'thin'. Countries which are highly fragmented, comprised of many islands, or which have many peninsulas or land areas in thin strips are likely to be prone to more transboundary effects. The land areas may also be more exposed to damage from natural disasters and human impacts (e.g. cyclones, fires, effects of war) in such areas, because the presence of refugia and ecosystem types that may form breaks are likely to be limited. Although fragmentation may also bring with it the possibility that damage could be limited by intervening areas of land or sea, there are likely to be higher risks that ecosystems and species (particularly if many are endemic) will not persist. This could be especially true if there are interactions with on-going human impacts. Larger countries with fragmentation are likely to be less at risk from this stressor than small ones and this indicator would need to be examined in tandem with Indicator 10 on country size.

Indicator	DISPEVI	**Collection**	EVI 2004
Indicator #	177	**Sub-Index**	

Indicator Name Country Dispersion (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable COUNTRYD, the authors applied the following break off values (where X =

natural log of the ratio of length of borders (land and maritime) to total land area):

EVI Score = 1 $X \leq 2$
EVI Score = 2 $2 < X \leq 3$
EVI Score = 3 $3 < X \leq 4$
EVI Score = 4 $4 < X \leq 5$
EVI Score = 5 $5 < X \leq 6$
EVI Score = 6 $6 < X \leq 7$
EVI Score = 7 $X > 7$

Rationale This indicator captures the degree to which a country's land area is fragmented and 'thin'. Countries which are highly fragmented, comprised of many islands, or which have many peninsulas or land areas in thin strips are likely to be prone to more transboundary effects. The land areas may also be more exposed to damage from natural disasters and human impacts (e.g. cyclones, fires, effects of war) in such areas, because the presence of refugia and ecosystem types that may form breaks are likely to be limited. Although fragmentation may also bring with it the possibility that damage could be limited by intervening areas of land or sea, there are likely to be higher risks that ecosystems and species (particularly if many are endemic) will not persist. This could be especially true if there are interactions with on-going human impacts. Larger countries with fragmentation are likely to be less at risk from this stressor than small ones and this indicator would need to be examined in tandem with Indicator 10 on country size.

Indicator ISOL **Collection** EVI 2004

Indicator # 178 **Sub-Index**

Indicator Name Geographic Isolation

Units Distance to nearest continent (in km)

Reference Year 2004

Source Times Comprehensive World Atlas 2000 used by EVI Team to estimate distances using the given scales.

Additional sources:

Cook Islands - Marine Resources. Works, Energy and PhysicalPlanning (MOWEPP)- Lands Dept., GIS; Kiribati - MapInfo Data from SOPAC. Land Management Division; Marshall Islands - Jacaranda Atlas 4th Edition; Nepal - World Atlas; New Zealand - NZMS 260 sheet A45 Topographic Map AUSLIG Place Names Database http://www.linz.govt.nz/rcs/linz/pub/web /root/home/index.jsp ; Niue - Justice, Lands and Survey - data taken from SOPAC 1997; Palau - Encarta Encyclopedia, Microsoft. Office of Planning & Statistics (OPS); Philippines - National Mapping and Resource Information Authority (NAMRIA); Samoa - Lands, Surveys & Environment; Singapore - Cadastral maps and IoF base system. Singapore land authority/ local survey's dept; Thailand - GIS Database. Pollution Control Dept; The Times Atlas of the World, Millenium Edition. 2000 Times Books, ISBN 0 7230 0792 6; Tuvalu - McLean, R. F. and Hosking, P. L. 1991 Land Resource Survey Report.

Methodology
1. Distance to nearest continent
2. Distance to the nearest continent within 10 degrees of latitude
3. Indicator is tested raw

Rationale This indicator captures the proximity of a country to the nearest continent. Note that if a country is within a continent, this value is zero. Isolated countries may have a greater risk of loss of ecosystem types and species during periods of stress if they are far away from refugia and sources of recolonisation. Isolated countries also likely to support fewer species than those which are close to large continents, or biogeographic centres of radiation. Additionally, there is less chance of genetic interchange (part of genetic resilience) in isolated areas. The likelihood of isolation being an important part of a country's ecological resilience

would be especially important if there are interactions with on-going human impacts. Countries close to sources of recolonisation are likely to be less at risk of permanent species losses, compared with those far away, particularly if they are small or fragmented. This indicator would need to be examined in conjunction with Indicators 10 and 11.

Indicator ISOLEVI **Collection** EVI 2004

Indicator # 179 **Sub-Index**

Indicator Name Geographic Isolation (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable ISOL, the authors applied the following break off values (where X = is the distance to nearest continent in km):

EVI Score = 1 $X \leq 0$
EVI Score = 2 $0 < X \leq 50$
EVI Score = 3 $50 < X \leq 100$
EVI Score = 4 $100 < X \leq 400$
EVI Score = 5 $400 < X \leq 800$
EVI Score = 6 $800 < X \leq 1600$
EVI Score = 7 $X > 1600$

Rationale This indicator captures the proximity of a country to the nearest continent. Note that if a country is within a continent, this value is zero. Isolated countries may have a greater risk of loss of ecosystem types and species during periods of stress if they are far away from refugia and sources of recolonisation. Isolated countries also likely to support fewer species than those which are close to large continents, or biogeographic centres of radiation. Additionally, there is less chance of genetic interchange (part of genetic resilience) in isolated areas. The likelihood of isolation being an important part of a country's ecological resilience would be especially important if there are interactions with on-going human impacts. Countries close to sources of recolonisation are likely to be less at risk of permanent species losses, compared with those far away, particularly if they are small or fragmented. This indicator would need to be examined in conjunction with Indicators 10 and 11.

Indicator RELIEF **Collection** EVI 2004

Indicator # 180 **Sub-Index**

Indicator Name Vertical Relief

Units Altitude range (highest point subtracted from the lowest point in country)

Reference Year 2001

Source CIA World Fact Book 2001

Additional Sources:

www.rtsd.mi.th/ (7/6/01).(Thailand); www.bartleby.com/151/a13.html (18/01/02); Cook Islands - Cook Islands National Environmental Management Strategy (NEMS) Report. SPREP; Federated States of Micronesia - Gawel, M. 1993. SoE FSM. SPREP; Greece - Greece Government Statistics; Kiribati - Maps from National Mapping and Resource Information Authority. Digitised 1:25000 Paper Maps, Ordinance Surveys, UK; Kyrgzystan - State Agency for Registration of rights on real estate. Contact - Ms. Goncharova E; Nauru - Lands & Survey.

Porthos Bop (674 4443845); Nepal - State of the Environment, Nepal (2001). Ministry of Population and Environment and Development. Nepal/UNEP/ICIMOD/NORAD/SACEP. Kathmandu;

Niue - Survey Data – Surveyors. Department of Justice, Land & Surveys; Palau - Bureau of Land Surveys. GIS Development. USGS Topographic Map; Papua New Guinea - Papua New Guinea Resource Information System. Raw data provided from source; Samoa - Topographic Maps (Mapping Section), NZ Map Series. Lands, Surveys & Environment-Samoa; Tuvalu - National Tidal Facility (NTF). Reduced level – Fongafale, Funafuti. Department of Lands and Survey; Vanuatu - Bellamy, J. Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Methodology Altitude range (highest point subtracted from the lowest point in country).

1. This indicator is a proxy for ecosystem diversity.
2. The indicator may also function as a proxy for habitat disturbance through avalanches, slides and large rivers.

Rationale Biodiversity of habitat & species, potential for habitat disturbance through movements of water and slides. A country with a large altitude range is likely to have a greater variety of ecosystems, which in very high altitude areas, or very low ones (e.g. the Black Sea) leads to the formation of “endemic habitat types”. These can be an integral part of the character of a country, and if lost, the same arguments as for endemic species applies

Indicator RELIEFEVI **Collection** EVI 2004

Indicator # 181 **Sub-Index**

Indicator Name Vertical Relief (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable RELIEF, the authors applied the following break off values (where X = is the highest point subtracted from the lowest point in country):

EVI Score = 1 $X < 1500$
EVI Score = 2 $1500 \leq X < 3000$
EVI Score = 3 $3000 \leq X < 4500$
EVI Score = 4 $4500 \leq X < 6000$
EVI Score = 5 $6000 \leq X < 7000$
EVI Score = 6 $7000 \leq X < 8000$
EVI Score = 7 $8000 \leq X$

Rationale Biodiversity of habitat & species, potential for habitat disturbance through movements of water and slides. A country with a large altitude range is likely to have a greater variety of ecosystems, which in very high altitude areas, or very low ones (e.g. the Black Sea) leads to the formation of “endemic habitat types”. These can be an integral part of the character of a country, and if lost, the same arguments as for endemic species applies

Indicator LOW **Collection** EVI 2004

Indicator # 182 **Sub-Index**

Indicator Name Lowlands

Units Percentage of total land area which is ≤50m above sea level anywhere in the country.

Reference Year 2004

Source Encarta 2004 World Atlas

Additional Sources:

www.bcas.net/Publication/SoE/SoE_index.htm (16/01/03) (Bangladesh); Marshall Islands - CIA World Fact Book website. Contact – Wilfredo Rada. Ministry of Internal Affairs/ Division of Lands and Surveys; Singapore - Singapore topographical map, 1998. Land Survey's Department; Kiribati - Digitised 1:25000 Paper Maps, Ordinance Surveys, UK. Kiribati Land Management Division; Niue - GIS/ Visual. Departmet of Justice, Lands and Survey; Palau - Bureau of Land Surveys. GIS Development. USGS Topographic Map; Samoa - Topographic Maps (Mapping Section), NZ Map Series. Lands, Surveys & Environment-Samoa; Kyrgyzstan - Department of State Ecological Control and Environment Utilisation. Contact - Mr Narynbek Mersaliev; Thailand - The Royal Thai Survey Department. Contact - Tel 66 2 2982253 Fax 66 2 2982240 marinepollution_pcd@yahoo.com ; Barbados - Lands and Surveys Department. Contact - Mr Nigel Marshall; Trinidad and Tobago - Arnold Balgaroo; Cook Islands - Ministry of Works, Energy & Physical Planning (MOWEPP) Contact - Timoti Tangiruaine (682 24484/ 682 21134); Federated States of Micronesia - Land & Natural Resources (Pohnpei). Contact - Herson Anson; Nauru - Lands & Survey. Conatct - Porthos Bop (674 4443845); New Zealand - Land Information New Zealand; Tuvalu - Department of Lands and Survey. Contact - Tesimita Ailesi.

Methodology Data were extracted from electronic maps available through Encarta 2004 using a point intercept method. Overlays with a large number of regularly-spaced dots were placed over maps. These were enumerated for the whole country and again for those parts shaded as being ≤50 above sea level. Note that because the method used is a statistical one, it is possible for a country to have a small area of its land below 50m that was not detected by the method, resulting in a value of 0%. The converse is true for countries recorded as having 100% of their land below 50m above sea level. In-country data were supplied for area ≤10m above sea level by collaborators, but only for 11 countries, a number insufficient for this indicator. As a result the in-country data were not used in this analysis.

Percentage of land area ≤50m above sea level
Percentage of land area ≤10m above sea level

1. Although this indicator was originally defined in relation to land areas ≤10 above sea level, data were difficult to obtain. Although maps are available locally in some countries that could be used to calculate area of land at or below this level, coverage was generally poor. It was necessary to redefine the indicator to include all land areas ≤50m which is shown on global maps.

2. We consider the use of ≤50m a proxy for this indicator. The indicator will be more valuable when data for land area ≤10m become generally available.

3. Data were extracted by the EVI Team on Encarta 2004 Maps using a point intercept method on electronic maps at a scale 1:7.4million.

Rationale This indicator focuses on the presence of lowlands in a country with implied impacts associated with pollution, ecosystem disturbance, flooding and coastal vulnerability. Areas of lowlands are those that will tend to be the first to flood, will tend to accumulate pollution that is mobilised by surface run-off, provide an important entry point (and extraction point) for groundwaters and if on the coasts of the sea or lakes may be subject to storm surges, tsunamis or sea level rise. They tend to be areas of high biodiversity and/or form critical habitats. They may also be critical areas for productivity, soil formation, erosion, natural resources and pollution attenuation. A country's resilience to future hazards will be related to risks on lowland areas. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator LOWEVI **Collection** EVI 2004

Indicator # 183 **Sub-Index**

Indicator Name Lowlands (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2004

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable LOWLANDS, the authors applied the following break off values (where X = is the percentage of total land area which is ≤50m above sea level anywhere in the country):

EVI Score = 1 X = 0
EVI Score = 2 X ≤ 15
EVI Score = 3 15 < X ≤ 30
EVI Score = 4 30 < X ≤ 45
EVI Score = 5 45 < X ≤ 60
EVI Score = 6 60 < X ≤75

Rationale This indicator focuses on the presence of lowlands in a country with implied impacts associated with pollution, ecosystem disturbance, flooding and coastal vulnerability. Areas of lowlands are those that will tend to be the first to flood, will tend to accumulate pollution that is mobilised by surface run-off, provide an important entry point (and extraction point) for groundwaters and if on the coasts of the sea or lakes may be subject to storm surges, tsunamis or sea level rise. They tend to be areas of high biodiversity and/or form critical habitats. They may also be critical areas for productivity, soil formation, erosion, natural resources and pollution attenuation. A country's resilience to future hazards will be related to risks on lowland areas. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human

Indicator BORD **Collection** EVI 2004

Indicator # 184 **Sub-Index**

Indicator Name Shared Borders

Units Number of borders shared with other countries, regardless of whether they are on land or in the sea.

Reference Year 2000

Source CIA Fact file 2000
Encarta World Atlas 1999, 2000
SOPAC EEZ Maps for the Pacific

Additional Sources:

Philippines - Bureau of Fisheries and Aquatic Resources (BFAR) Administrative Reports; Singapore - Communicable disease surveillance in Singapore 2000. Quarantine and Epidemiology Department; Fiji - Return of Notifiable Diseases for Year 1992-1998. Fisheries Department; Federated States of Micronesia - Reported Notifiable Diseases Summary. NHSO, Department of Health, Education and Social Affairs; Marshall Islands - Crawford, M. 1992. RMI National Environmental Management Strategy (NEMS) Report: Part A (State of Environment); Tonga - Bureau of Public Health: Monthly Report. Environmental Planning & Conservation Section. Lupe Matoto & Asipeli Palaki (676 23611/ 23216/ imepacs@candw.to , Vailala@candw.to); Kyrgyzstan - Inspectorate of Sanitation and Epidemiological Control. Contact - Mr. Usenbaev; Thailand - Pollution Control Dept. Thailand, Water Quality Management

Division. Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com ;Costa Rica - Ministerio de Salud; Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Cook Islands - Totokoitu Research Station. Contact - Brian Tairea (682 28711 or 28720) Ministry of Agriculture; Kiribati - T Tebaitongo. Fisheries Division; New Zealand - Ministry of Health. Contact - Hine-Wai Loose: Ministry of Foreign affairs and Trade; Niue - Niue Department of Agriculture, Forestry & Fisheries. Contact - Sauni Tongatule (4032/ 4079/ tongatules@mail.gov.nu); Tonga - Lupe Matoto & Asipeli Palaki (676 23611/ 23216/ imepacs@candw.to, Vailala@candw.to); Tuvalu - Agriculture. Contact - C. Howells.

Methodology Number of land and sea borders shared with other countries.

1. High seas areas are not considered, though they are usually under some form of management that has implications for surrounding countries.

2. For sea borders, assessments were made by the EVI team using a 200 nm limit from the coast of a country.

Rationale This indicator captures the risk to terrestrial and aquatic ecosystems from transboundary risks including species introductions, lack of control of effects from neighbouring countries, lack of control of straddling stocks of resources, and uncontrolled migrations of humans (e.g. refugees). The greater the number of different jurisdictions broidering a country by land or sea, the greater the risks of neighbour effects that is risks to the environment caused by the policies and behaviours of other countries. The effects of these factors would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator BORDEVI **Collection** EVI 2004

Indicator # 185 **Sub-Index**

Indicator Name Shared Borders (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable BORDERS, the authors applied the following break off values (where X = is the number of borders shared with other countries, regardless of whether they are on land or in the sea):

EVI Score = 1 $X = 0$
EVI Score = 2 $0 < X \leq 2$
EVI Score = 3 $2 < X \leq 4$
EVI Score = 4 $4 < X \leq 6$
EVI Score = 5 $6 < X \leq 8$
EVI Score = 6 $8 < X \leq 10$
EVI Score = 7 $X > 10$

Rationale This indicator captures the risk to terrestrial and aquatic ecosystems from transboundary risks including species introductions, lack of control of effects from neighbouring countries, lack of control of straddling stocks of resources, and uncontrolled migrations of humans (e.g. refugees). The greater the number of different jurisdictions broidering a country by land or sea, the greater the risks of neighbour effects that is risks to the environment caused by the policies and behaviours of other countries. The effects of these factors would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	IMBAL	**Collection**	EVI 2004
Indicator #	186	**Sub-Index**	

Indicator Name Ecosystem Imbalance

Units + or - change in trophic level calculated by weighting each trophic level present in the national catch by the tonnes reported.

Reference Year NA

Source University of British Colombia; Fisheries Centre, Lower Mall Research Station; Methods described in: http://data.fisheries.ubc.ca/references/pdfs/MappingFF.pdf and http://data.fisheries.ubc.ca/references/pdfs/whatsleft.pdf

See also www.seaaroundus.org

Additional sources:

Philippines - Bureau of Fisheries and Aquatic Resources (BFAR) Administrative Reports; Singapore - Communicable disease surveillance in Singapore 2000. Quarantine and Epidemiology Department; Fiji - Return of Notifiable Diseases for Year 1992-1998. Fisheries Department; Federated States of Micronesia - Reported Notifiable Diseases Summary. NHSO, Department of Health, Education and Social Affairs; Marshall Islands - Crawford, M. 1992. RMI National Environmental Management Strategy (NEMS) Report: Part A (State of Environment); Tonga - Bureau of Public Health: Monthly Report. Environmental Planning & Conservation Section. Lupe Matoto & Asipeli Palaki (676 23611/ 23216/ imepacs@candw.to , Vailala@candw.to); Kyrgyzstan - Inspectorate of Sanitation and Epidemiological Control. Contact - Mr. Usenbaev; Thailand - Pollution Control Dept. Thailand, Water Quality Management Division. Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com ;Costa Rica - Ministerio de Salud; Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Cook Islands - Totokoitu Research Station. Contact - Brian Tairea (682 28711 or 28720) Ministry of Agriculture; Kiribati - T Tebaitongo. Fisheries Division; New Zealand - Ministry of Health. Contact - Hine-Wai Loose: Ministry of Foreign affairs and Trade; Niue - Niue Department of Agriculture, Forestry & Fisheries. Contact - Sauni Tongatule (4032/ 4079/ tongatules@mail.gov.nu); Tonga - Lupe Matoto & Asipeli Palaki (676 23611/ 23216/ imepacs@candw.to, Vailala@candw.to); Tuvalu - Agriculture. Contact - C. Howells.

Methodology Weighted average change in trophic level since fisheries began (for trophic level slice ≤3.35)

1 This indicator includes only those species with a trophic level of 3.35 or below. This constitutes a trophic slice, intended to exclude large pelagic fisheries usually caught offshore.

2 A positive (+) change indicates an increase in trophic level present in the catch, which would be consistent with an increase in the catch of larger fish-eating fishes. This is usually associated with an expansion of the fishery and a move to greater use of large pelagic species, usually offshore.

3 A negative (-) change is usually associated with loss of fishes in the higher trophic levels and indicates fishing down of the food web, ecosystem damage and overfishing.

4 This indicator is sensitive to over aggregation of taxa in the country catch data. This may lead to a reduced ability to detect changes in trophic level.

Rationale Ecosystem stress, loss of diversity, damage to the trophic structure of ecosystems, loss of balance. This indicator captures the risk to aquatic ecosystems from risks associated with shifting the natural relationships, diversity and energy-flows within and among ecosystems. Although fisheries are used here, the indicator is more generally concerned with the downstream effects on habitats and other organisms. The greater the downward (negative) trend in trophic level change, the more likely that the marine biomass and trophic structures have been damaged. Such changes could lead to outbreaks or overgrowth of unexpected or

pest organisms, monopolies of certain species, and losses of ecosystem elements that may be dependent on the behaviour or populations of others. The effects of these factors would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator IMBALEVI **Collection** EVI 2004

Indicator # 187 **Sub-Index**

Indicator Name Ecosystem Imbalance (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year NA

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable IMBALANCE, the authors applied the following break off values (where X = + or - change in trophic level calculated by weighting each trophic level present in the national catch by the tonnes reported):

EVI Score = 1 $X \geq 0$
EVI Score = 2 $0 > X \geq -0.02$
EVI Score = 3 $-0.02 > X \geq -0.04$
EVI Score = 4 $-0.04 > X \geq -0.06$
EVI Score = 5 $-0.06 > X \geq -0.08$
EVI Score = 6 $-0.08 > X \geq -0.10$
EVI Score = 7 $X < -0.10$

Rationale Ecosystem stress, loss of diversity, damage to the trophic structure of ecosystems, loss of balance. This indicator captures the risk to aquatic ecosystems from risks associated with shifting the natural relationships, diversity and energy-flows within and among ecosystems. Although fisheries are used here, the indicator is more generally concerned with the downstream effects on habitats and other organisms. The greater the downward (negative) trend in trophic level change, the more likely that the marine biomass and trophic structures have been damaged. Such changes could lead to outbreaks or overgrowth of unexpected or pest organisms, monopolies of certain species, and losses of ecosystem elements that may be dependent on the behaviour or populations of others. The effects of these factors would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator OPEN **Collection** EVI 2004

Indicator # 188 **Sub-Index**

Indicator Name Environmental Openness

Units Freight density as X = thousands of dollars of freight moved into the country per sq km of land

Reference Year 1997

Source WRI 2000-2001

Additional Sources:

www.motc.go.th (6/6/01)(Thailand); www.stats.govt.nz/ (New Zealand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Greece - Statistical Yearbook of Greece 1998-99, EU Trade Statistics 1999-2000; Federated States of Micronesia - 1999 FSM Statistical

Yearbook. FSM DEA/ SD (Statistical Dept); Fiji - Customs Annual Report 1997, Parliamentary Paper No. 16 of 1998; Tonga - 1994 – 1995 Annual Reports. Ministry of Marine and Ports (MMP); Barbados - Summary of Operations Table, 1999. Barbados Port Authority; Samoa - Annual Statistical Abstract 1998, pp79. Department of Statistics; Kyrgyzstan - State Customs Inspectorate. Contact - Mrs. Baitakova Marta; Singapore - Ministry of transport. Contact - Mr Harvey Yeo, tel ++(63) 757725 Harvey.Yeo@mot.gov.sg ;Costa Rica - Ministerio de Hacienda; Cook Islands - Air Cargo Manifest, Cargo Division, Rarotonga; Palau - Lee Wally Customs; Tuvalu - Internal records (estimates). Shipping Agent. Contact - Christopher Ikae.

Methodology Total USD freight imports per year over the past 5 years by any means / sq km land area.

Total tonnage of freight imported per year over the past 5 years by any means / sq km land area

1. Data on tonnages were provided by 14 of the 32 collaborators, but were not available from public sources.

2. The public data available are expressed in $ values of freight imports and are not averages

Rationale This indicator captures the risk of damage to a country through the importation of foreign materials (physical, chemical and biological) by land, air or sea through the large volumes of freight that move around the globe annually. Countries with large amounts of freight moving into them are considered more at risk of inadvertent introductions of diseases, species and genetically modified organisms, than those with lower levels of freight movements. The likelihood of such introductions negatively affecting a country's resilience would be especially important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts. This includes the importing of hazardous wastes. Freight imports may also be a mechanism for the introduction of pollution risks not normally found in a country e.g. the import of radioactive substances, oil, chemicals.

Indicator OPENEVI **Collection** EVI 2004

Indicator # 189 **Sub-Index**

Indicator Name Environmental Openness (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1997

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable OPENNESS, the authors applied the following break off values (where Freight density as X = thousands of dollars of freight moved into the country per sq km of land):

EVI Score = 1 $X \leq 1$
EVI Score = 2 $1 < X \leq 1.5$
EVI Score = 3 $1.5 < X \leq 2$
EVI Score = 4 $2 < X \leq 2.5$
EVI Score = 5 $2.5 < X \leq 3$
EVI Score = 6 $3 < X \leq 3.5$

Rationale This indicator captures the risk of damage to a country through the importation of foreign materials (physical, chemical and biological) by land, air or sea through the large volumes of freight that move around the globe annually. Countries with large amounts of freight moving into them are considered more at risk of inadvertent introductions of diseases, species and genetically modified organisms, than those with lower levels of freight movements. The likelihood of such introductions negatively affecting a country's resilience would be especially

important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts. This includes the importing of hazardous wastes. Freight imports may also be a mechanism for the introduction of pollution risks not normally found in a country e.g. the import of radioactive substances, oil, chemicals.

Indicator	MIG	**Collection**	EVI 2004
Indicator #	190	**Sub-Index**	

Indicator Name Migratory Species

Units Density of migratory species expressed as number of species per 1000 sq km land area under various categories of GROMS migrants.

Reference Year 1998-2001

Source GROMS Database (includes: IUCN Red Book of Endangered Organisms 2000; African mammal database (AMD) 1998; Erasien Anatidae Atlas; Artic Bird Database 1998; WCMC Turtle Database 1999; Fishbase 1998; Slender-billed curlew database 2000; Maps of non passerine birds 1992-2001).

Additional sources:

www.biologie.uni-freiburg.de/data/zoology/riede/grooms/Getting_Started/Definition/ (24/01/2003); Costa Rica - Escuela de Biología, Universidad de Costa Rica.

Methodology Number of known species that migrate outside the territorial area at any time during their life spans (include land and aquatic species) / area of land.

1. Data are likely to be incomplete and biased towards obvious species such as mammals and birds, and economically important species such as tunas. Insects, marine invertebrates and microorganisms are unlikely to be correctly represented.

2. Categories of GROMS migrants include intracontinental, intercontinental, nomadising, emigration, range extension, interoceanic, intraoceanic, and for fishes: anadromous, catadromous, amphidromous, potamodromous, limnodromous, oceanodromous.

3. Not all of the migrating species in a country necessarily migrate outside a country's borders.

Rationale This indicator focuses of species which pass outside of the control of the country and which during that time may be affected by actions of surrounding countries, or distant nations utilising them as a resource. It focuses on biodiversity, resilience and persistence of species with large variances in population numbers and or /that are susceptible to local extinctions. Straddling stocks of migrating mammals and fishes may also be key species in determining ecosystem conditions in a country, and damage to these while they are outside the country may lead to indirect effects on ecosystems within the country (e.g. migrating mammals as determinants of grasslands in Africa and America). Species could become endangered or threatened in a country, despite good internal management, with implied impacts on biodiversity, ecosystem integrity and resilience to future hazards. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator	MIGEVI	**Collection**	EVI 2004
Indicator #	191	**Sub-Index**	

Indicator Name Migratory Species (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1998-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable MIGRATORY, the authors applied the following break off values (where X = density of migratory species expressed as number of species per 1000 sq km land area under various categories of GROMS migrants):

EVI Score = 1 $X \leq 1$
EVI Score = 2 $1 < X \leq 1.5$
EVI Score = 3 $1.5 < X \leq 2$
EVI Score = 4 $2 < X \leq 2.5$
EVI Score = 5 $2.5 < X \leq 3$
EVI Score = 6 $3 < X \leq 3.5$
EVI Score = 7 $X > 3.5$

Rationale This indicator focuses of species which pass outside of the control of the country and which during that time may be affected by actions of surrounding countries, or distant nations utilising them as a resource. It focuses on biodiversity, resilience and persistence of species with large variances in population numbers and or /that are susceptible to local extinctions. Straddling stocks of migrating mammals and fishes may also be key species in determining ecosystem conditions in a country, and damage to these while they are outside the country may lead to indirect effects on ecosystems within the country (e.g. migrating mammals as determinants of grasslands in Africa and America). Species could become endangered or threatened in a country, despite good internal management, with implied impacts on biodiversity, ecosystem integrity and resilience to future hazards. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator ENDEM **Collection** EVI 2004

Indicator # 192 **Sub-Index**

Indicator Name Endemic Species

Units Species per million km2

Reference Year 2000-2001

Source WRI 2000-2001

Additional sources:

UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Cook Islands - Cook Islands Biodiversity & Natural Heritage Database. Natural Heritage Project; Federated States of Micronesia - The Nature Conservancy. Contact - Bill Raynor (691 3204267/ 691 3207422); Fiji - Draft of Fiji Biodiversity Strategy Action Plan (1999) National Trust for Fiji; Greece - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Birds of Christmas Island. Information for Visitors – Christmas Island Wildlife Sanctuary (Wildlife Conservation Unit). Department of Environment & Conservation (E & C); Kyrgyzstan - Department of State Ecological Control. Contact - Mr. Narynbek Mersaliev; Marshall Islands - Crawford, M. 1992 Republic of the Marshall Islands National Environmental Strategy (NEMS); Nauru - Thaman, R R and Hasall D C. 1999. Nauru National Environmental Strategy (NEMS); Nepal - Bio-diversity profiles, Annual Publications of plant resources. His Majesty's Government of Nepal and Department of Plant Resources, Netherlands; Niue - Niue SoE Report, 1994. SPREP (pp 15); Palau - Freifeld, H and Otobed, D O. 1997. A Preliminary Wildlife Management Plan for the Republic of Palau; Papua New Guinea - Sekhrau, N and Miller, S (eds). PNG Country Study on Biological Diversity, 1991 – 1993; Samoa - Government of Samoa National Report to the Convention of Biological Diversity. 1998. Division of Environment & Conservation, Department

of Lands, Survey & Environment; Thailand - Office of Environmental Policy and Planning (1996) Thailand's Biodiversity; Tonga - A) Watling. D. 1982 Birds of Fiji, Tonga & Samoa. B) Yunker T. G. 1959 Plants of Tonga; Tuvalu - Conservation Unit. Watling, D; Vanuatu - National Biodiversity Survey & Big Bay Conservation Area Report. Environment Unit, SPBCP.

Methodology Number of known species that migrate outside the territorial area at any time during their life spans (include land and aquatic species) / area of land.

Where multiple values for these measures were reported, these were reduced to the lowest given value for use in the analysis. That is, if 2 and 3 were returned for a measure, the value 2 was used in the analysis. If no value given, 0 was used.

Rationale Biodiversity and the risk of losing unique species. The more endemic species a country has, the more vulnerable it is because localised extinction cannot be resupplied from elsewhere by natural or augmented recolonisation. Losses of key species can affect ecosystems and potential for sustainable activities for foreign exchange.

Indicator ENDEMEVI **Collection** EVI 2004

Indicator # 193 **Sub-Index**

Indicator Name Endemic Species (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable ENDEMICS, the authors applied the following break off values (where X = species per million km2):

EVI Score = 1 $0 \leq X$
EVI Score = 2 $0 < X \leq 2$
EVI Score = 3 $2 < X \leq 4$
EVI Score = 4 $4 < X \leq 6$
EVI Score = 5 $6 < X \leq 8$
EVI Score = 6 $8 < X \leq 10$
EVI Score = 7 $10 < X$

Rationale Biodiversity and the risk of losing unique species. The more endemic species a country has, the more vulnerable it is because localised extinction cannot be resupplied from elsewhere by natural or augmented recolonisation. Losses of key species can affect ecosystems and potential for sustainable activities for foreign exchange.

Indicator INTRO **Collection** EVI 2004

Indicator # 194 **Sub-Index**

Indicator Name Introductions

Units Number of species introduced per 1000 sq km of land area.

Reference Year 2002

Source FAO 2002 website

Additional sources:

www.fao.org/scripts/acqintro/query/retrive.idc (15/02/2002); Cook Islands - Cook Islands Biodiversity & Natural Heritage Database. Natural Heritage Project. Contact - Gerald McCormack (682 20959); Federated States of Micronesia - The Nature Conservancy. Contact - Bill Raynor (691 3204267/ 691 3207422); Fiji - National Trust for Fiji; Kiribati - Thaman & Tebano. 1994. Kiribati Plant and Fish Names. A Preliminary Listing; Kyrgyzstan - Department of State Ecological Control. Contact - Mr. Narynbek Myrsaliev; Nauru - Thaman, R R and Hassall, D C. 1999.Nauru National Environmental Management Strategy (NEMS); Nepal - IUCN (1999), Nepal Country Report on Biological Diversity, Kathmandu, Nepal; Palau - Freifeld, H and Otobed, D O. 1997 A Preliminary Wildlife Management Plan for the Republic of Palau; Papua New Guinea - Sekhrau, N and Miller, S (eds). Papua New Guinea Country; Samoa - Government of Samoa National Report to the Convention of Biological Diversity. 1998. Division of Environment & Conservation, Department of Lands, Survey & Environment; Study on Biological Diversity, 1991 - 1993; Thailand - Thailand's Biodiversity. (1996) Office of Environmental Policy and Planning. Pollution Control Department; Tonga - Watling. D. 1982 Birds of Fiji, Tonga and Samoa; Tuvalu - Seluka. S. Cultural Significance & Utility of Plants and Fisheries.

Methodology Number of introduced species per 1000 square kilometre of land area.

1. All known introductions are included, regardless of the year. The earliest recorded in this data set are from the 14th Century in Romania, but most are since the 19th and 20th Centuries.

2. Data are likely to be incomplete and biased towards obvious species such as mammals and birds. Insects, marine invertebrates and microorganisms are unlikely to be correctly represented.

3. Data from in-country sources were used in preference to FAO data only in cases where the two were less than 10x different. Several in-country sources gave extremely high values not likely to be correct, possibly because they misunderstood the data required. For example, one country returned a value of 1500 introduced species of fungi.

4. The overall number of introductions in the FAO database is likely to be low, even for obvious species. Most countries would have several hundred species of imported agricultural and domestic plants and animals that do not appear to be in this list.

Rationale This indicator captures past species introductions to a country with implied impacts on biodiversity and ecosystem integrity. This may include impacts at the levels of populations, genetics, species and ecosystems through complex ecological interactions. Past introductions of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts.

Indicator INTROEVI **Collection** EVI 2004

Indicator # 195 **Sub-Index**

Indicator Name Introductions (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2002

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable INTRODUCTIONS, the authors applied the following break off values (where density of introductions as X = number of species introduced per 1000 sq km of land area):

EVI Score = 1 $X = 0$
EVI Score = 2 $0 < X \leq 1$

EVI Score = 3 $1 < X \leq 1.5$
EVI Score = 4 $1.5 < X \leq 2$
EVI Score = 5 $2 < X \leq 2.5$
EVI Score = 6 $2.5 < X \leq 3$
EVI Score = 7 $X > 3$

Rationale This indicator captures past species introductions to a country with implied impacts on biodiversity and ecosystem integrity. This may include impacts at the levels of populations, genetics, species and ecosystems through complex ecological interactions. Past introductions of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts.

Indicator ENDANG **Collection** EVI 2004

Indicator # 196 **Sub-Index**

Indicator Name Endangered Species

Units Density of endangered species expressed as number of species per 1000 sq km land area categorised by IUCN as either critically endangered, endangered or vulnerable.

Reference Year 2000

Source IUCN Red Book 2000

Additional sources:

www.redlist.org/info/tables.html (27/09/01); Cook Islands - Cook Islands Biodiversity & Natural Heritage Database. Natural Heritage Project. Contact - Gerald McCormack (682 20959); Federated States of Micronesia - The Nature Conservancy. Contact - Bill Raynor (691 3204267/ 691 320 7422); Fiji - Draft of Fiji Biodiversity Strategy & Action Plan 1999. (FBSAP). FBSAP Committee; Greece - Contact - Anastasios Legakis, Zoological Museum; Kiribati - A) Wilson, C. 1994. Kiribati State of Environment Report. B) Biodiversity Strategy & Action Plan (BSAP). 2000. BSAP Planning Team; Marshall Islands - Crawford, M. 1992 RMI National Environmental Management Strategy (NEMS) (pp 6); Nauru - A) Thaman, R R and Hassall, D C. 1999; Nauru National Environmental Management Strategy (NEMS). B) InfoNation (from UN Statistics Division); Nepal - Bio-diversity profiles of the high mountains and high Himal, Dept of National Parks; Niue - A) Guide to the Birds of Niue Book, 1998. SPREP. B) Brooke, A. 1997/8. Niue Bat Report. C) Bereteh, Mohammed. UGA/ BIRIGUR LATRO Report; Palau - Freifeld, H and Otobed, D O. 1997. A Preliminary Wildlife Management Plan for the Republic of Palau; Papua New Guinea - Sekhrau, N and Miller, S (eds). PNG Country Study on Biological Diversity, 1991 – 1993; Philippines - Protected Areas and Wildlife Bureau (PAWB) Statistics. Contact - Mr. Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph ; Samoa - A) Tu'u'uleti Taulealo, State of Environment Report: Samoa, Government of Samoa. 1993. (note: data on plants only) B) Government of Samoa National Report to the Convention of Biological Diversity. 1998. Division of Environment & Conservation, Department of Lands, Survey & Environment; Thailand - Office of Environmental Policy and Planning (1996) Thailand's Biodiversity; Tonga - A) Report of the Minister for Fisheries for the year 1997 Govt. of Tonga. B) Report of the Minister for Fisheries for the year 1998 Govt. of Tonga C) Biology, Exploitation & Management of Giant Clams D) First Report on a Data Acquisition and Monitoring System for Fanga'uta Lagoon System, Tongatapu, Kingdom of Tonga; Trinidad and Tobago - Cindy Buchoon. Curator of the National Herbarium of Trinidad; Tuvalu - A) IUCN Red Data Book 1990 B) IUCN 1997 Giant Clams: Status, Trade & Mariculture; Vanuatu - Contact - Ernest Bani (678 25302/ 23565) Environment Unit.

Methodology Number of endangered and vulnerable species per 1000 sq km land area (IUCN definitions).

1. All known critically endangered, endangered and vulnerable species are included, as categorised by IUCN between the years of 1981 and 2000.

2. Data are likely to be incomplete and biased towards obvious species such as mammals and birds. Insects, marine invertebrates and microorganisms are unlikely to be correctly represented.

3. Data from in-country sources were used where IUCN data were unavailable.

Rationale This indicator focuses on those species that have become endangered or threatened in a country with implied impacts on biodiversity and ecosystem integrity. These are the species most likely to next become extinct, and may already be resulting, by their reduced numbers, in impacts at the levels of populations, genetics, species and ecosystems through complex ecological interactions. The reduction of populations of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator ENDANGEVI **Collection** EVI 2004

Indicator # 197 **Sub-Index**

Indicator Name Endangered Species (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable ENDANGERED, the authors applied the following break off values (where X = density of endangered species expressed as number of species per 1000 sq km land area categorised by IUCN as either critically endangered, endangered or vulnerable):

EVI Score = 1 $X = 0$
EVI Score = 2 $0 < X \leq 1$
EVI Score = 3 $1 < X \leq 2$
EVI Score = 4 $2 < X \leq 3$
EVI Score = 5 $3 < X \leq 4$
EVI Score = 6 $4 < X \leq 5$
EVI Score = 7 $X > 5$

Rationale This indicator focuses on those species that have become endangered or threatened in a country with implied impacts on biodiversity and ecosystem integrity. These are the species most likely to next become extinct, and may already be resulting, by their reduced numbers, in impacts at the levels of populations, genetics, species and ecosystems through complex ecological interactions. The reduction of populations of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator EXTINCT **Collection** EVI 2004

Indicator # 198 **Sub-Index**

Indicator Name Extinctions

Units Number of known extinct species per 1000 sq km land area.

Reference Year 1900-2000

Source

IUCN Red Book 2000

Additional sources:

www.redlist.org/info/tables.html (27/09/01); Cook Islands - Biodiversity and Natural Heritage Database. Contact - Gerald McCormack (682 20959) Natural Heritage Project; Federated States of Micronesia - The Nature Conservancy. Contact - Bill Raynor (691 3204267/ 691 320 7422); Fiji - Draft of Fiji Biodiversity Strategy & Action Plan (FBSAP). (1991) National Trust of Fiji; Kiribati - Contact - Michael Phillips. Environment & Conservation Division; Marshall Islands - Crawford, M. 1992 RMI National Environmental Management Strategy (NEMS) (pp 6); Nauru - Thaman, R R and Hassall, D C. 1999.
Nauru National Environmental Management Strategy (NEMS); Nepal - IUCN (1999), Nepal Country Report on Biological Diversity (pp 44), Kathmandu, Nepal; Niue - A) Niue SoE Report, 1994. SPREP (pp 15). B) From SPC. Department of Agriculture, Forestry & Fisheries (P O Box 74, Alofi, Niue); Palau - Freifeld, H and Otobed, D O. 1997. A Preliminary Wildlife Management Plan for the Republic of Palau; Papua New Guinea - Sekhrau, N and Miller, S (eds). PNG Country Study on Biological Diversity, 1991 - 1993.
Samoa - Schuster, C; Whistler, A and Siuli, T. The Conservation of Biological Diversity in Upland Ecosystems of Samoa; Thailand - Office of Environmental Policy and Planning (1996) Thailand's Biodiversity; Tonga - Watling. D. Wildlife Conservation and Management: pp161; Tuvalu - Contact - Claudia Ludescher Environment Unit; Vanuatu - Contact - Ernest Bani (678 25302/ 23565) Environment Unit.

Methodology

Number of species known to have become extinct since 1900 per 1000 sq km land area (IUCN definitions).

1. All known extinctions are included, as categorised by IUCN between the years of 1900 and 2000.

2. Data are likely to be incomplete and biased towards obvious species such as mammals and birds. Insects, marine invertebrates and microorganisms are unlikely to be correctly represented.

3. Undescribed species will not be represented and may be becoming extinct without human knowledge.

4. It is possible for species to become extinct in a country, but not globally extinct. From the perspective of the country concerned, and the environments in it, loss from a country is considered an extinction in that country. If the species are available in other countries, this opens the possibility for a species to become 'unextinct' in the future.

5. We considered using % of known species which have become extinct as the basis of this indicator, but this would tend to hide the real numbers of species that could be lost in very diverse and/or large countries. In terms of environmental vulnerability, countries should aim at ensuring no further species become extinct, not merely gauging their efforts as a percentage of those species available in the country. In a very small, undiverse country, 0.1% extinctions could mean 10 species. In a large or diverse country this percentage could mean the loss of 100 species. Loss per unit area addresses this problem.

6. Countries in which most clearance and species loss occurred pre-1900 (e.g. Europe) have apparently low vulnerabilities in this indicator. This does not represent their true state in terms of extinctions simply because different time frames are being compared.

7. Data from in-country sources were used where IUCN data were unavailable.

Rationale

This indicator focuses on those species that have become extinct in a country with implied impacts on biodiversity and ecosystem integrity. The loss of these species has resulted in a loss of biodiversity, and may also have resulted in impacts on ecosystem structure and function through complex ecological interactions. The loss of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many

sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator EXTINCTEVI **Collection** EVI 2004

Indicator # 199 **Sub-Index**

Indicator Name Extinctions (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1900-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable EXTINCTIONS, the authors applied the following break off values (where X = density of extinctions expressed as number of known extinct species per 1000 sq km land area):

EVI Score = 1 X = 0
EVI Score = 2 $0 < X \leq 0.25$
EVI Score = 3 $0.25 < X \leq 0.5$
EVI Score = 4 $0.5 < X \leq 0.75$
EVI Score = 5 $0.75 < X \leq 1$
EVI Score = 6 $1 < X \leq 1.25$
EVI Score = 7 $X > 1.25$

Rationale This indicator focuses on those species that have become extinct in a country with implied impacts on biodiversity and ecosystem integrity. The loss of these species has resulted in a loss of biodiversity, and may also have resulted in impacts on ecosystem structure and function through complex ecological interactions. The loss of species could negatively affect a country's resilience to future hazards. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator VEG **Collection** EVI 2004

Indicator # 200 **Sub-Index**

Indicator Name Natural Vegetation Cover Remaining

Units Percentage of original (and regrowth) vegetation cover remaining.

Reference Year 2000-2001

Source WRI 2000-2001
FAO State of the World's Forests, 1995, 2000.

Additional sources:

www.forest.go.th/stat42/stat.htm (7/6/01) (Thailand); Source 1: FAO - State of the World's Forests 2000, pp 150-153; Source 2: FAO - State of the World's Forests 1995, Table 2: pp 125-130; Source 3: FAO - State of the World's Forests 1995, Table 2: pp 125-130; Source 4: FAO - State of the World's Forests 1995, Table 2: pp 125-131, Table 3: pp 131-135; Botswana - Botswana Rangeland, Inventory and Monitoring Project (BRIMP) Information System. Contact - Mr R. M. Kwerepe267-350511 Phone; 267-307057 Fax. rkwerepe@gov.bw ; Costa Rica - Observatorio del desarrollo; Fiji - Contact - Wolf F. SOPAC. Information Technology Unit; Greece - Internal (Greek Embassy, USA), External (CIA World Factbook). Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Barr, J. Ministry of Natural Resources Development (MNRD) 2) Thaman, R. and Whistler, W. FAO; Kyrgyzstan - The

National Report on Environment Conditions for 1998-1999; Marshall Islands - Ministry of Resource and Natural Development(MRND). Contact - Frederick Muller; Nauru - Thaman, R R and Hassall, D C. 1999; Nauru National Environmental Management Strategy (NEMS) Nepal - Forest resources of Nepal (1987-1998) Department of forest Research and Survey, Kathmandu, Nepal; Niue - Country Report for UNCED Niue. Government of Niue & SPREP Consultants: Lowry, C and Smith, J.; Palau - Vegetation Survey of the Republic of Palau. Pacific Southwest Forest and Range Experiment Station. Division of Agriculture and Mineral Resources; Papua New Guinea - Papua New Guinea Resource Information System (PNG RIS) (Landuse Section). Contact - Mame Kasalau (675 3214458 or 1046/ 3217813); Philippines - Philippine Forestry Statistics. Contact - Ms Mayumi Ma. Quintos / Chief, Forest Economics Division / FMB; Samoa - National Environment and Development Management Strategies. 1993. Western Samoa Task Team in association with SPREP; Tuvalu - McLean, R. F. and Hosking, P. C. 1991. Land Resource Survey; Vanuatu - Bellamy, J. Commonwealth Scientific and Industrial Research Organisation (CSIRO) Land Use & Planning Office (LUPO).

Methodology Percentage of natural and regrowth vegetation cover remaining (include forests, wetlands, prairies, tundra, desert and alpine associations).

1. Amount of natural cover considered here should encompass all ecosystem types, whether forests, grasslands or deserts.

2. Data provided by WRI are expressed as percentage of forests remaining, and may not cover tundra, deserts, alpine and herb areas and grasslands etc.

3. Data from WRI refers to Original forest cover about 8,000 years ago assuming current climatic conditions.

4. Data from in-country sources were used for countries not covered by WRI.

5. The definition of regrowth forest is one in which regrowth is unsupported by human (other than in allowing natural regeneration) and results in a forest community that is self-sustaining indefinitely (not withstanding climatic changes).

Rationale This indicator focuses on the loss of natural vegetation cover in a country with implied impacts on biodiversity and ecosystem integrity. The loss of natural vegetation has resulted in a loss of biodiversity, and may also have resulted in impacts on ecosystem structure and function through complex ecological interactions. Areas of natural vegetation are viewed as refugia for threatened species, those unknown to science, or those which may act as a future resource (e.g. for biochemical applications). Natural forests and vegetated areas are also likely to be important areas for groundwater intake, soil production, CO2 – oxygen relationships and attenuating air and water pollution. A country's resilience to future hazards will be related to the rate and total loss of naturally vegetated areas. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator VEGEVI **Collection** EVI 2004

Indicator # 201 **Sub-Index**

Indicator Name Natural Vegetation Cover Remaining (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable VEGETATION, the authors applied the following break off values (where X

= percentage of original (and regrowth) vegetation cover remaining):

EVI Score = 1 X > 80
EVI Score = 2 60 < X ≤ 80
EVI Score = 3 40 < X ≤ 60
EVI Score = 4 20 X ≤ 40
EVI Score = 5 10 < X ≤ 20
EVI Score = 6 0 < X ≤ 10
EVI Score = 7 X = 0

Rationale

This indicator focuses on the loss of natural vegetation cover in a country with implied impacts on biodiversity and ecosystem integrity. The loss of natural vegetation has resulted in a loss of biodiversity, and may also have resulted in impacts on ecosystem structure and function through complex ecological interactions. Areas of natural vegetation are viewed as refugia for threatened species, those unknown to science, or those which may act as a future resource (e.g. for biochemical applications). Natural forests and vegetated areas are also likely to be important areas for groundwater intake, soil production, CO2 – oxygen relationships and attenuating air and water pollution. A country's resilience to future hazards will be related to the rate and total loss of naturally vegetated areas. This would be especially important if there are many sensitive ecosystems susceptible to the loss of keystone species and interactions with on-going human impacts.

Indicator VEGLO **Collection** EVI 2004

Indicator # 202 **Sub-Index**

Indicator Name Loss of natural vegetation cover

Units Percent change in natural forest cover over last 5 years.

Reference Year 2000-2001

Source

WRI 2000-2001
FAO 1995 and 2001 State of the World's Forests

Additional sources:

UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; FAO - State of the Worlds Forests 2001; FAO - State of the Worlds Forests 1995; Costa Rica - Centro de Investigaciones en Desarrollo Sostenible. (CIDS); Kiribati - A) Thaman & Whistler, UNDP, Suva. B) Barr, J. Ministry of Natural Resources Development (MNRD)
Nauru - Thaman. R, Hassall. D 1998 Nauru National Environmental Management Strategy (NEMS), (pp 14); Nepal - State of the Environment, Nepal, 2001. Ministry of population and Environment, Nepal/UNEP/ICIMOD/NOROD/SACEP, Kathmandu Nepal.
Niue - Lane, J & SPREP, 1994. Niue SoE Report, 1993; Palau - Environmental Quality Protection Board Permit Files. Contact - Paul Christiansen (680 4881639 or 3600/ 4882963/ EZRA@PALAUNET.COM); Papua New Guinea - Internal data from source. Papua New Guinea Resource Information System (PNGRIS) Contact - Mame Kasalau (675 3214458 or 1046/ 3217813). Technical & Field Services Division, Department of Agriculture & Livestock/ Special Project Officer; Samoa - Department of Lands, Surveys & Environment (DLSE) Aerial Photos 1990 - 1999. Contact - Leoo Polutea, DLSE; Thailand - www.forest.go.th/stat42/stat/htm (7/6/01); Trinidad & Tobago - Karen Ragoonanan; Tuvalu - Contact - EVI Team (Dr U Kaly); Vanuatu - Land Use and Planning Office (LUPO). Contact William (LUPO).

Methodology

Net percentage change in natural vegetation cover over the last five years.

Net percentage of land area changed by removal of natural vegetation over the last five years.

1. Values may be +ve or -ve, where a positive value indicates net regrowth and a negative value indicates loss.

2. For WRI data, with the exception of South Africa and Australia, forest areas in developed countries are not broken down into the subcategories of natural and plantation because of the difficulty of distinguishing the two in many countries.

3. FAO data were not used for analysis because very large changes between 1995 and 2000 were often spurious, in some countries leading to >-100% change, a result which is clearly not possible.

4. Values are only for forest cover and do not include non-forest forms of natural vegetation (tundra, grasslands, alpine and herb associations)

Rationale This measures the rate of loss or gain of natural vegetation cover in countries. It focuses on of biodiversity, ecosystem resilience, the capacity of a country to attenuate pollution, prevention of soil loss, reduction of runoff, recharging of ground waters and soil formation.

Indicator VEGLOEVI **Collection** EVI 2004

Indicator # 203 **Sub-Index**

Indicator Name Loss of natural vegetation cover (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable LOSS VEG, the authors applied the following break off values (where X = percentage of original (and regrowth) vegetation cover remaining):

EVI Score = 1 $X > 0$
EVI Score = 2 No EVI
EVI Score = 3 No EVI
EVI Score = 4 $X = 0$
EVI Score = 5 $-1 \leq X < 0$
EVI Score = 6 $-2 \leq X < -1$
EVI Score = 7 $X < -2$

Rationale This measures the rate of loss or gain of natural vegetation cover in countries. It focuses on of biodiversity, ecosystem resilience, the capacity of a country to attenuate pollution, prevention of soil loss, reduction of runoff, recharging of ground waters and soil formation.

Indicator FRAG **Collection** EVI 2004

Indicator # 204 **Sub-Index**

Indicator Name Fragmented Habitats

Units 1. Total length of all roads in a country (km) / land area (sq km)

2. Cumulative area of all fragments of natural cover greater than 1,000 ha in the country as a percent of total land area.

Reference Year 1990-1999

Source World Bank World Development Indicators 2001
http://www.worldbank.org/data/wdi2001/cdrom.htm

Additional sources:

www.worldbank.org/data/wdi2001/cdrom.htm ; www.forest.go.th/state41/index.htm ; Costa Rica - Ministerio del Ambiente y Energía, Estudio nacional de la biodiversidad, con datos del sistema de información geográfica INBio. Mayo, 1998; Papua New Guinea - Source - Forest Inventory Mapping System (FIMS). Contact - P. Shearman, German Development Service for the Department of Mines.

Methodology Total length of all roads in a country (latest data) / land area.

1. Data were generally unavailable for the original form of this indicator.

2. A proxy of the total length of roads was used. The reasoning behind this is that the length of roads shows not only how dissected and disturbed the land ecosystems may be, but they act as physical barriers for seasonal migrations and normal daily home range movements of animals. Secondarily, roads also lead to direct losses of animals through vehicular accidents.

Rationale This is a proxy measure for pressure on ecosystems resulting from fragmentation into discontinuous pieces. It also relates to habitat disturbance and degradation. Fragmentation is likely to affect biodiversity, affecting species with variability in population numbers, keystones, those susceptible to local extinctions, those that use migration corridors and the persistence of species with large home ranges. For many large mammals and some birds viable fragments of habitat are size-dependent, despite the fact that the overall area available in a country may still sum to a relatively large area. This indicator measures a specific aspect of habitat availability that relates to size and quality of patches. The effects of fragmentation would be particularly important if there are other natural and human stresses operating on susceptible organisms and ecosystems.

Indicator FRAGEVI **Collection** EVI 2004

Indicator # 205 **Sub-Index**

Indicator Name Fragmented Habitats (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1990-1999

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable FRAGMENTATION, the authors applied the following break off values (where X = percentage of original (and regrowth) vegetation cover remaining):

EVI Score = 1 $X < 0.2$
EVI Score = 2 $0.2 < X \leq 0.4$
EVI Score = 3 $0.4 < X \leq 0.6$
EVI Score = 4 $0.6 < X \leq 0.8$
EVI Score = 5 $0.8 < X \leq 1.0$
EVI Score = 6 $1.0 < X \leq 1.2$
EVI Score = 7 $X > 1.2$

Rationale This is a proxy measure for pressure on ecosystems resulting from fragmentation into discontinuous pieces. It also relates to habitat disturbance and degradation. Fragmentation is likely to affect biodiversity, affecting species with variability in population numbers, keystones, those susceptible to local extinctions, those that use migration corridors and the persistence of species with large home ranges. For many large mammals and some birds viable fragments of habitat are size-dependent, despite the fact that the overall area available in a country may still sum to a relatively large area. This indicator measures a specific aspect of habitat availability that relates to size and quality of patches. The effects of fragmentation would be

particularly important if there are other natural and human stresses operating on susceptible organisms and ecosystems.

Indicator	DEG	**Collection**	EVI 2004
Indicator #	206	**Sub-Index**	

Indicator Name Degradation

Units Percent of a country's land area considered severely and very severely degraded.

Reference Year 2000

Source FAO / AGL Terrastat: Severity of human induced degradation.

Additional sources:

www.fao.org/ag/agl/agll/terrastat/wsrout.Asp?wsreport=4&region=2&search=Disp/ (17/01/02); Botswana - Botswana Rangeland, Inventory and Monitoring Project (BRIMP) Information System. Contact - Mr R. M. Kwerepe 267-350511 – Phone; 267-307057 – Fax. Email -rkwerepe@gov.bw; Cook Islands - Contact - Timoti Tangiruaine (682 24484/ 682 21134) Marine Resources. Works, Energy and Physical Planning (MOWEPP)- Lands Department, GIS; Costa Rica - Comisión asesora sobre Degradación de Tierras (CADETI), 2002; Kiribati - Internal information (1969 - 1998 data) Land Management Division. Contact - Riteri Kiboi. Survey Technical Section; Kyrgyzstan - State Agency for Registration of rights on real estate under the Government of the Kyrgyz Republic. Contact - Ms. Goncharova E.; Marshall Islands - Contact - Frederick Muller. Ministry of Resource and Natural Development (MRND); Nauru - RDF Study GIS Maps (provided). Nauru Rehabilitation Corporation (NRC); Nepal - State of Environment, Nepal, 2001, HMG-N / NORAD / UNEP / ICIMOD / SACEP, Kathmandu, Nepal;

Niue -

Niue Department of Fisheries, Forestry and Agriculture (DAFF). Contact - Sauni Tongatule (4032/ 4079/ director.agriculture@mail.gov.nu); Palau - Contact - Kashgar Rengulbai (680 4882504/ 4881475/ DAMR@palaunet.com) Environmental Quality Protection Board(EQPB); Philippine - Philippine Asset Accounts, Land and Soil Resource (updates unpublished). National Statistical Coordination Board, Land and Soil Resource; Samoa - Aerial photos 1981, 1987, 1990, 1997. Land, Surveys & Environment; Thailand - GIS. The Pollution Control Department; Tuvalu - Gavin and Hina 5th - 8th March, 1997. Report on Extent of Damage. Damage Assessment Team. Environment Unit; Vanuatu - VANRIS (V3). Contact - William: Land Use Planning Office (LUPO).

Methodology Data are the status in 2000 and are derived from FAO/AGL Terrastat. These values were then recalculated as the percentage of the total land area considered severely or very severely degraded. Although there are lighter forms of degradation, these were not included in this indicator. The indicator measures the most severe forms of past degradation in a country as an indicator of poor management in the past, lost resilience and a prognosis if current practices continue. Countries with high levels of degradation have already sustained damage and could be expected to be less resilient to future damage.

1. Data are percentage of land area that is severely or very severely degraded. Lighter forms of degraded land were not included.

Rationale This indicator captures the status of loss of ecosystems in a country. Degraded land means that which can no longer revert to its natural ecosystem without active and costly rehabilitation by humans to reverse permanent damage, if at all. Types of degradation include water and wind erosion, chemical and physical deterioration, agriculture, deforestation and grazing. These can be associated with salinisation and desertification. This indicator highlights the breakdown of ecosystems which leads to decreasing biodiversity, soil quality, resilience against natural events and the assimilative capacity of the environment.

Indicator DEGEVI **Collection** EVI 2004

Indicator # 207 **Sub-Index**

Indicator Name Degradation (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable DEGRADATION, the authors applied the following break off values (where X = percent of a country's land area considered severely and very severely degraded.):

EVI Score = 1 $X \leq 5$
EVI Score = 2 $5 < X \leq 10$
EVI Score = 3 $10 < X \leq 15$
EVI Score = 4 $15 < X \leq 20$
EVI Score = 5 $20 < X \leq 25$
EVI Score = 6 $25 < X \leq 50$
EVI Score = 7 $X > 50$

Rationale This indicator captures the status of loss of ecosystems in a country. Degraded land means that which can no longer revert to its natural ecosystem without active and costly rehabilitation by humans to reverse permanent damage, if at all. Types of degradation include water and wind erosion, chemical and physical deterioration, agriculture, deforestation and grazing. These can be associated with salinisation and desertification. This indicator highlights the breakdown of ecosystems which leads to decreasing biodiversity, soil quality, resilience against natural events and the assimilative capacity of the environment.

Indicator RESRV **Collection** EVI 2004

Indicator # 208 **Sub-Index**

Indicator Name Terrestrial Reserves

Units Percent of the total land area set aside as reserves.

Reference Year 2000-2001

Source WRI 2000-2001

Additional sources:

www.forest.go.th/stat42/stat.htm (7/6/01) (Thailand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Botswana - A. Government of Botswana, National Report on Measures taken to Implement the Convention of Biological Diversity, 1998 B) The National Conservation Strategy Coordinating Agency, Southern African Biodiversity Support Program, Status of Biodiversity in Botswana, 2002; Cook Islands - Contact - Antoine Nia (682 21256/ 682 22256) Environment Services; Costa Rica - Ministerio del Ambiente y Energía, Sistema Nacional de Áreas de Conservación; Fiji - Mining Tenement Licenses/ Exploration & Minerals Digest. Mineral resource Department; Greece - Zool. Museum, University of Athens. Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Contact - Michael Phillips. Environment & Conservation Division (E&CD); Kyrgyzstan - Contact - Mr. Myrsaliev N(Unit of Conventions). Department of State Ecological Control and Environment Utilization.
Marshall Islands - JACAP, p. 5. Project Prep. Document. SPREP. Republic of Marshall Islands Environmental Protection Agency; Nepal - Annual report, 2000, Department of National Parks. Department of National Parks, Kathmandu; New Zealand - Contact - Hine-Wai Loose. Ministry

for the Environment; Niue - Huvalu Information Leaflet. Huvalu Forest Conservation Area Project; Palau - Permit Files - Environmental Quality Protection Board Robert (Bob) Marek (680 4881639 or 3600/ 4882963/ eqpb@palaunet.com); Papua New Guinea - Conserving Biological Diversity. A Strategy for Protected Areas in the Asia – Pacific Region. Braatz, Susan. Office of Environment & Conservation; Samoa - IUCN Directory of Protected Areas in Oceania. World Conservation Monitoring Centre. Lands, Surveys & Environment; Singapore - National parks board (national conservation branch) Contact - Dr Lana Chan: Tel 0065 64719931 / fax 0065 6472 9225 E-Mail: Lena_chan@nparks.gov.sg. Assistant Director; St Lucia - Biodiversity Report, 1998. Statistics Department; Tonga - Thistle, Sheppard, and Prescott. The Kingdom of Tonga, Action Strategy. SPREP. IUCN. Environmental Planning & Conservation Section; Trinidad & Tobago - Contact - Cindy Buchoon; Tuvalu - Mc Lean, R. F. and Hosking, P. C. 1991. Tuvalu Land Resource Survey Report. Country Report. A report prepared for the Food and Agriculture Organisation of the United Nations acting as executing agency for the United Nations Development Programme.; Department of Lands and Survey; Vanuatu - 3rd National Development Plan and Vanuatu Economic Performance, Policy & Reform Issues - Vango & ADB respectively. Environment Unit.

Methodology Percent of terrestrial land area legally set aside as no take reserves.

1. Data refer to area of land especially dedicated to the protection and maintenance of biological diversity, of natural and associated cultural resources, and which are managed through legal or other effective means (see WRI 2000-2001).

2. Reserves includes lakes, rivers, swamps and other aquatic habitats located within the land area of a reserve.

3. See notes in Section 6 on definitions.

Rationale This indicator captures the increase in resilience, function of pollution attenuation, groundwater recharge, limits to losses of biodiversity and refuges afforded by the presence of adequate terrestrial reserves (including aquatic ecosystems located within the land area) in a country. The indicator focuses on areas with the most intact terrestrial environments and the level of environmental management. The benefits of areas set aside as terrestrial reserves increase with increasing area, increasing representation of ecosystem types, increasing degree of protection and period of time of protection. Permanent no-take reserves that are representative of major ecosystem types and occupy 20% of the land area would be considered ideal. Reserves would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts in the country. Reserves may be one of the few ways managers could off-set some other environmental damage and build resilience against natural events that can damage the environmental support system.

Indicator RESRVEVI **Collection** EVI 2004

Indicator # 209 **Sub-Index**

Indicator Name Terrestrial Reserves (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable RESERVES, the authors applied the following break off values (where X = percent of the total land area set aside as reserves):

EVI Score = 1 $20 \leq X$
EVI Score = 2 $15 < X < 20$
EVI Score = 3 $10 < X \leq 15$

EVI Score = 4 5 < X ≤ 10
EVI Score = 5 0 < X ≤ 5
EVI Score = 6 Not used
EVI Score = 7 X=0

Rationale

This indicator captures the increase in resilience, function of pollution attenuation, groundwater recharge, limits to losses of biodiversity and refuges afforded by the presence of adequate terrestrial reserves (including aquatic ecosystems located within the land area) in a country. The indicator focuses on areas with the most intact terrestrial environments and the level of environmental management. The benefits of areas set aside as terrestrial reserves increase with increasing area, increasing representation of ecosystem types, increasing degree of protection and period of time of protection. Permanent no-take reserves that are representative of major ecosystem types and occupy 20% of the land area would be considered ideal. Reserves would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts in the country. Reserves may be one of the few ways managers could off-set some other environmental damage and build resilience against natural events that can damage the environmental support system.

Indicator MPA

Collection EVI 2004

Indicator # 210

Sub-Index

Indicator Name Marine Reserves

Units Percent of the shelf area set aside as marine reserves.

Reference Year 1999-2001

Source UNEP WCMC 1999 (Using IUCN categories Ia to VI)
WRI 2000-2001 (for area of continental shelf)

Additional sources:

www.forest.go.th/ (Thailand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Cook Islands - Contact - Ian Bertram (682 28722/ 682 29721/ rar@mmr.gov.ck) Director - Research & Economic Development(RED).
Costa Rica - Ministerio del Ambiente y Energía, Sistema Nacional de Áreas de Conservación; Federated States of Micronesia - Action Strategy for the Pacific. 1997. SPREP. The Nature Conservancy; Greece - Zool. Museum, University of Athens. Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Contact - Michael Phillips. Environment & Conservation Division (E&CD); Kyrgyzstan - Contact - Mr. Myrsaliev N(Unit of Conventions). Department of State Ecological Control and Environment Utilization; Marshall Islands - SPREP. Jaluit Atoll Conservation, p.5. Area Project - Project Preparation Document. Earth Moving Department; New Zealand - Contact - Hine-Wai Loose. Ministry for the Environment; Niue - Fisheries Resources Survey of the Island of Niue. Department of Fisheries, Forestry and Agriculture(DAFF); Palau - Palau Conservation Society Fact sheet; Papua New Guinea - Conserving Biological Diversity. A Strategy for Protected Areas in the Asia Pacific Region. Braatz, Susan. Office of Environment & Conservation; Samoa - IUCN Directory of Protected Areas in Oceania. World Conservation Monitoring Centre. Lands, Surveys & Environment; Tonga - IUCN Directory of Protected Areas in Oceania. Environmental Planning & Conservation Section; Tuvalu - Environment Unit GOT and SPREP, 1995. Department of Lands and Survey; Vanuatu - Contact - Ernest Bani (678 25302/ 23565) Principal Environment Officer/Environment Unit. Contact - Mary Cordiner. Email -Info@wcmc.org.uk. UNEP World Conservation Monitoring Centre (WCMC).

Methodology

The raw data for this indicator are comprised of the total area of marine reserves (MPAs) established in countries. Data are derived from UNEP WCMC 1999, based on IUCN categories Ia-VI, and from in-country sources. These values were then divided by total area of continental shelf (from WRI 2000-2001) to produce a percentage of shelf area set aside as

MPAs.

1. Landlocked countries are not included in the data and distributions analysed below. They are not given an EVI score for this indicator. Their overall EVI scores are calculated from the remaining indicators.

2. The denominator used for calculating percentage is area of continental shelf from WRI. It is possible for countries to have >100% in this indicator if part of their EEZ is designated. This could lead to misleading results only if countries designate large area of their EEZs as MPAs, or if they designate only oceanic areas from their EEZs as MPAs.

3. Protected areas outside of the continental shelf area need to be omitted from this indicator.

4. See Section 6 below for definitions.

Rationale This indicator captures the increase in resilience, function of pollution attenuation and fisheries production, limits to losses of biodiversity and refuges afforded by the presence of adequate marine reserves in a country. The indicator focuses on areas with the most intact marine environments and the level of environmental management. The benefits of areas set aside as marine and coastal reserves increase with increasing area, increasing representation of

ecosystem types, increasing degree of protection and period of time of protection. Permanent no-take reserves that are representative of major ecosystem types and occupy 20% of the shelf area would be considered ideal. Reserves would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts in the country. Reserves may be one of the few ways managers could off-set some other environmental damage and build resilience against natural events that can damage the environmental support system.

Indicator MPAEVI **Collection** EVI 2004

Indicator # 211 **Sub-Index**

Indicator Name Marine Reserves (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1999-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable MPAs, the authors applied the following break off values (where X = percent of the shelf area set aside as marine reserves):

EVI Score = 1 $20 \leq X$
EVI Score = 2 $15 < X < 20$
EVI Score = 3 $10 < X \leq 15$
EVI Score = 4 $5 < X \leq 10$
EVI Score = 5 $0 < X \leq 5$
EVI Score = 6 Not used
EVI Score = 7 $X=0$

Rationale This indicator captures the increase in resilience, function of pollution attenuation and fisheries production, limits to losses of biodiversity and refuges afforded by the presence of adequate marine reserves in a country. The indicator focuses on areas with the most intact marine environments and the level of environmental management. The benefits of areas set aside as marine and coastal reserves increase with increasing area, increasing representation of ecosystem types, increasing degree of protection and period of time of protection. Permanent no-take reserves that are representative of major ecosystem types and occupy 20% of the

shelf area would be considered ideal. Reserves would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts in the country. Reserves may be one of the few ways managers could off-set some other environmental damage and build resilience against natural events that can damage the environmental support system.

Indicator FARM **Collection** EVI 2004

Indicator # 212 **Sub-Index**

Indicator Name Intensive Farming

Units Mean tonnes of intensively farmed animals produced per year per sq km of land.

Reference Year 1995-2000

Source FAO 1996-2000 data

Additional sources:

Costa Rica Observatorio del desarrollo; Greece - Statistical Yearbook of Greece 1998; Marshall Islands - Laura Farm. Agriculture & Quarantine. Contact - Jimmy Josephs; Nepal - Statistical information on Nepalese Agriculture 1999/2000. Ministry of Agriculture and Co-operatives, Kathmandu, Nepal; Palau - Statistical Yearbook, 1999. Planning and Statistics. Agriculture Division; Samoa - 1989 Agriculture Census & Field Surveys. Ministry of Agriculture Forests, Fisheries and Meteorology (MAFFM); Singapore - Agri-Food & Veterinary Authority(AVA). Contact - Koay Sim Huat. Email - koay_sim_huat@ava.gov.sg ; Thailand - National Statistical Coordination Board, Philippine Statistical Yearbook. Bureau of Agricultural Statistics Thailand - www.apps.fao.org/lim500/nph-wrap.pl?Production.Livestock.Stocks&Domain=SUA&servlet=1 A) www.dld.go.th/DLD_web/yearly/stat_dat.html B) www.nso.go.th/thai/stat/shrimp/shrimp.pdf ; Trinidad &Tobago Contact - Cindy Buchoon; Vanuatu - Raw data from source. Samos, A. Vanuatu Agriculture Supplies/ Agriculture Department.

Methodology Average annual tonnage of intensively farmed animal products (includes aquaculture, pigs, chickens, cattle, etc.) produced over the last 5 years per square kilometre land area.

1. We were not able to find a database that focused on quantifying intensive farming. We were able to find FAO data 1996-2000 on total numbers of animal stocks.

2. Numbers on animal stocks were converted to tonnages using average weights for the farmed animals.

3. Tonnages on aquiculture products were available in tonnes from FAO for the years 1995 and 1999.

Rationale This indicator captures the risk of pollution, eutrophication, ecosystem loss or damage and the risk of diseases and plagues. It focuses on lands being used for intensive agriculture, which we define as those in which the wastes produced over the land are in excess of the ability of that same land area to attenuate them. Intensive farming includes the farming of poultry, pigs, aquaculture, and some farming of cattle and other animals where kept in feed lots. Intensive farming usually involves clearing of land, feeding, heavy use of pesticides and other medications and a concentrated production of wastes. It concentrates the environmental requirements of farmed animals into a small area, and wastes often find their way into the surrounding water table, waterways and land areas. Countries with a large production through intensive farming methods are also considered more at risk of inadvertent introductions of diseases, species and genetically modified organisms. The effects of intensive farming would be especially important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts.

Indicator FARMEVI **Collection** EVI 2004

Indicator # 213 **Sub-Index**

Indicator Name Intensive Farming

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1995-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable FARMING, the authors applied the following break off values (where X = mean tonnes of intensively farmed animals produced per year per sq km of land):

EVI Score = 1 $X \leq 2$
EVI Score = 2 $2 < X \leq 3$
EVI Score = 3 $3 < X \leq 4$
EVI Score = 4 $4 < X \leq 5$
EVI Score = 5 $5 < X \leq 6$
EVI Score = 6 $6 < X \leq 7$
EVI Score = 7 $X > 7$

Rationale This indicator captures the risk of pollution, eutrophication, ecosystem loss or damage and the risk of diseases and plagues. It focuses on lands being used for intensive agriculture, which we define as those in which the wastes produced over the land are in excess of the ability of that same land area to attenuate them. Intensive farming includes the farming of poultry, pigs, aquaculture, and some farming of cattle and other animals where kept in feed lots. Intensive farming usually involves clearing of land, feeding, heavy use of pesticides and other medications and a concentrated production of wastes. It concentrates the environmental requirements of farmed animals into a small area, and wastes often find their way into the surrounding water table, waterways and land areas. Countries with a large production through intensive farming methods are also considered more at risk of inadvertent introductions of diseases, species and genetically modified organisms. The effects of intensive farming would be especially important if there are many endangered species, sensitive ecosystems that could be affected by key species, and interactions with on-going human impacts.

Indicator FERTL **Collection** EVI 2004

Indicator # 214 **Sub-Index**

Indicator Name Fertilisers

Units Kilograms of fertilisers used per year per km2 total land area.

Reference Year 1995-1997

Source WRI 2000-2001
OECD 1999

Additional sources:

www.reports.eea.eu.int/ (2/06/2001) (Greece); OECD 1999, pp 276,279; UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Cook Islands - Cook Islands Customs Import Entries – Extract from database. Cook Islands Statistics Office; Costa Rica - Observatorio del desarrollo / San José, COSTA RICA, 2001; Fiji - Bureau of Statistics/ Department of Agriculture; Kiribati - Internal data (copies of invoices from divisional files). Contact - Manate Tenang (686 28109 or 28108) Agriculture Division; Kyrgyzstan - Department of chemicalixation and plant protection. Contact - Mrs. Malyutina L.V. Mr. Katarov V.M; Marshall Islands - Contact - Laura

Farm. Agriculture & Quarantine, Ministry of R & D (Resource & Development); Nauru - Contact - Frank W Davey. Analysis Lab; Palau - Agriculture Monthly Reports. Agriculture Division. Contact - Kashgar Rengulbai (680 4882504/ 4881475/ DAMR@palaunet.com); Philippine - Philippine Statistical Yearbook. Fertilizer and Pesticide Authority.A) 1998 Imports Report B) 1994-1997 Imports Report; Samoa - Agriculture Store Corp. FADINAP, 1998: 41 & 1999: 17 & 10. Ministry of Agriculture; Thailand - State of Environment Report 1998 by Office of Environmental Policy and Planning. Center of Agricultural Statistics, Office of Agricultural Economics, Ministry of Agricultural Cooperatives; Tonga - Annual Trade Report 1995 - 1999. Statistics Department; Trinidad & Tobago - Contact - Karen Ragoonanan; Tuvalu - Department of Agriculture. Contact - Itaia Lausaveve; Vanuatu - Alan Sands. Vanuatu Agricultural Supplies; Ministry of Agriculture, Livestock & Forestry.

Methodology Average annual intensity of fertiliser use over the total land area (kg/yr/km2) over the last 5 years.

1. WRI: Fertiliser refers to nutrients in terms of nitrogen (N), phosphate (P2O5), and potash (K2O). Fertiliser use is calculated using a trade balance approach. As nations sometimes increase or decrease their stocks of fertiliser in a given year, actual use may be larger or smaller than the figure given. If the sale of fertiliser stocks is particularly large, there is the potential for a negative fertiliser use value.

2. Data are averages for the period 1995-1997.

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from the use of chemical NPK fertilisers. This indicator is a measure of damage to ecosystems, water and soil quality, coral reefs and other sensitive organisms through eutrophication, pollution, soil damage and salinisation. The effects of using NPK fertilisers depends on the intensity of application and time and space needed for natural attenuation. The effects of releasing large amounts of fertilisers into the environment would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator FERTLEVI **Collection** EVI 2004

Indicator # 215 **Sub-Index**

Indicator Name Fertilisers (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1995-1997

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable FERTILISERS, the authors applied the following break off values (where X = kilograms of fertilisers used per year per km2 total land area):

EVI Score = 1 $X \leq 2$
EVI Score = 2 $2 < X \leq 4$
EVI Score = 3 $4 < X \leq 6$
EVI Score = 4 $6 < X \leq 7$
EVI Score = 5 $7 < X \leq 8$
EVI Score = 6 $8 < X \leq 9$
EVI Score = 7 $X > 9$

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from the use of chemical NPK fertilisers. This indicator is a measure of damage to ecosystems, water and soil quality, coral reefs and other sensitive organisms through eutrophication, pollution, soil damage and salinisation. The effects of using NPK fertilisers depends on the intensity of

application and time and space needed for natural attenuation. The effects of releasing large amounts of fertilisers into the environment would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator PESTCD **Collection** EVI 2004

Indicator # 216 **Sub-Index**

Indicator Name Pesticides

Units Kilograms pesticides used per year per km2 of total land area.

Reference Year 1996-1997

Source WRI 2000-2001
OECD 1999

Additional sources:

www.reports.eea.eu.int/ (2/06/2001) (Greece); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; OECD 1999, pp 280-281; Cook Islands - Cook Islands Customs Imports Entries. Extract from Trade Database – Imports. Cook Islands Statistics Office; Costa Rica - Observatorio del desarrollo / San José, COSTA RICA, 2001; Fiji - Bureau of Statistics. Contact - Jone Feresi (384233)- Department of Agriculture; Kiribati - Internal data (copies of invoices from divisional files). Contact - Manate Tenang (686 28109 or 28108) Agriculture Division; Kyrgyzstan - Department of chemicalixation and plant protection. Contact - Mrs. Malyutina L.V. Mr. Katarov V.M.; Marshall Islands - Contact - Laura Farm. Agriculture & Quarantine; Nepal - Office records. Ministry of Agriculture and Co operatives. Assistant Agro-Economist, Pradhyumna Rej Pandey, Phone +1 223441; Niue - Niue Department of Fisheries, Forestry and Agriculture (DAFF). Contact - Sauni Tongatule (4032/ 4079/ director.agriculture@mail.gov.nu); Palau - Environmental Quality Protection Board (EQPB) Kashgar Rengulbai (680 4882504/ 4881475/ DAMR@palaunet.com) - Agriculture; Samoa - Agriculture Store Corp. & Farm Supplies Ltd. FAO Questionnaire; Pesticides Technical Committee, 1999. Agriculture; St Lucia - Compendium of Environmental statistics. Road transport division, ministry of communications, works, transport and pub. Utilities; Thailand - State of Environment Report 1998 by Office of Environmental Policy and Planning. Center of Agricultural Statistics, Office of Agricultural Economics, Ministry of Agricultural Cooperatives; Tuvalu - Contact - Itaia Lausaveve - Agriculture Department; Vanuatu - Alan Sands - Vanuatu Agricultural Supplies.

Methodology Average annual pesticides used as kg/km2/year over total land area over last 5 years.

1. Data for this indicator are from WRI 2000-2001 and were expressed as loads in kg/yr/ha of cropland. We have recalculated them in terms of kg/yr/ha of total land area because this is the area over which they could potentially be attenuated.

2. Data are for 1996 or 1997 only and not an average of the last 5 years

3. Definitions: WRI: Pesticide use (1996) refers to per hectare use or sale to the agriculture sector of substances that reduce or eliminate unwanted plants or animals, especially insects. They include major groups of pesticides such as insecticides, mineral oils, herbicides, plant growth regulators, bacteria and seed treatments, and other active ingredients. OECD: Data include total pesticides, insecticides, fungicides, herbicides, fumigants, rodenticides and anti-coagulants.

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from heavy use of pesticides. The indicator focuses on damage and pollution of ecosystems, soil damage, damage to reproductive systems of organisms, loss of species, and damage to aquatic organisms including fisheries and coral reefs. Pesticides need time and a suitable area

of land or volume of water for their attenuation. High loads of mobile pesticides present risks to all aspects of the environment. The effects of introducing pesticides into the environment where they can accumulate would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator PESTCDEVI **Collection** EVI 2004

Indicator # 217 **Sub-Index**

Indicator Name Pesticides (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-1997

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable PESTICIDES, the authors applied the following break off values (where X = kilograms pesticides used per year per km2 of total land area):

EVI Score = 1 X = 0
EVI Score = 2 $0 < X \leq 0.5$
EVI Score = 3 $0.5 < X \leq 1$
EVI Score = 4 $1 < X \leq 2$
EVI Score = 5 $2 < X \leq 3$
EVI Score = 6 $3 < X \leq 4$
EVI Score = 7 $X > 4$

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from heavy use of pesticides. The indicator focuses on damage and pollution of ecosystems, soil damage, damage to reproductive systems of organisms, loss of species, and damage to aquatic organisms including fisheries and coral reefs. Pesticides need time and a suitable area of land or volume of water for their attenuation. High loads of mobile pesticides present risks to all aspects of the environment. The effects of introducing pesticides into the environment where they can accumulate would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator BIOTECH **Collection** EVI 2004

Indicator # 218 **Sub-Index**

Indicator Name Biotechnology

Units Cumulative number of deliberate field trials of GMOs in countries 1996-2000.

Reference Year 1986-2002

Source OECD Sept 2000 database - http://www1.oecd.org/ehs/table.htm
ISAAA International Services for the acquisition of agribiotech applications, 1997, 2002 http://www.isaaa.org/kc/
BINAS http://binas.unido.org/binas/trials.php3
BIOTECH 1991-1999 http://biotech.jrc.it/
Information Systems for Biotechnology (ISB), 2002; http://www.nbiap.vt.edu/

Additional sources:

www1.oecd.org/ehs/table.htm (Sept 2000);
www.isaac.org/kc/Global_Status/global/Europe/trialist.htm (International Services for the acquisition of Agribiotech Applications) (09/01/03); www.binas.unido.org/binas/trials.php3 (08/01/03); BIOTECH 1991-1999 http://biotech.jrc.it/ (08/01/03); Information Systems for

Biotechnology (ISB), 2002; http://www.nbiap.vt.edu/ (29/01/03); Costa Rica - Consejo Asesor de Degradación de Tierras (CADETI), 2002; Kyrgyzstan - Resolution of the Govt. #364; Singapore - Source - Agri-Food & Veterinary Authority of Singapore. Contact - Koay Sim Huat, Head International Affairs Division (63257638 /62206068 / koay_sim_huat@ava.gov.sg); St Lucia - Compendium of Environmental statistics. Road transport division, ministry of communications, works, transport and pub. Utilities.

Methodology Cumulative number of deliberate field trials of genetically modified organisms conducted in the country since 1986.

1. Although the number of deliberate field trials of GMOs does correlate with the size of countries, we did not convert this indicator to a density over the land area of a country. GMOs are considered capable of spreading once released into the field and we considered that the number of trials, particularly of different organisms would be a better measure of the risks involved in introducing new genetic materials into the environment.

2. ISAAA data show most countries with a zero value, while the remaining data sources show many of these with no data. For this evaluation of the EVI we have used the zero values provided by ISAAA.

3. Field trials can include several instances of a single GMO type.

4. Any kind of GMO is included.

Rationale This indicator captures the risk to genetic diversity, genetic pollution and unpredictable ecosystem effects of introducing incompletely tested and/or unpredictable bioengineered organisms into the environment. This includes new toxin-producing organisms, terminators (the use of deliberately sterile organisms is often used as a biological control method for pests) or organisms with new ecological behaviours. This indicator operates under the precautionary principle. The effects of releasing organisms developed under laboratory conditions into the environment are unknown until they are tested in the environment. We have used data on deliberate field trials of GMOs for this indicator. It is likely that the risks of GMOs are less dependent on the area used, and more dependent on the different types of GMOs being either tested or grown. That is, we see risk increasing more with exposure to increasing numbers of GMOs, rather than the number of instances of any one type because of the capacity to spread once a gene 'escapes'. Although operating at the genetic rather than species level, we see some of the risks of GMOs to ecosystems as being similar to those associated with introduced species.

Indicator BIOTECHEVI **Collection** EVI 2004

Indicator # 219 **Sub-Index**

Indicator Name Biotechnology (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1986-2002

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable BIOTECH, the authors applied the following break off values (where X = cumulative number of deliberate field trials of GMOs in countries 1996-2000):

EVI Score = 1 X = 0
EVI Score = 2 Not used
EVI Score = 3 Not used

EVI Score = 4 Not used
EVI Score = 5 0 < X ≤ 20
EVI Score = 6 20 < X ≤ 50
EVI Score = 7 X > 50

Rationale This indicator captures the risk to genetic diversity, genetic pollution and unpredictable ecosystem effects of introducing incompletely tested and/or unpredictable bioengineered organisms into the environment. This includes new toxin-producing organisms, terminators (the use of deliberately sterile organisms is often used as a biological control method for pests) or organisms with new ecological behaviours. This indicator operates under the precautionary principle. The effects of releasing organisms developed under laboratory conditions into the environment are unknown until they are tested in the environment. We have used data on deliberate field trials of GMOs for this indicator. It is likely that the risks of GMOs are less dependent on the area used, and more dependent on the different types of GMOs being either tested or grown. That is, we see risk increasing more with exposure to increasing numbers of GMOs, rather than the number of instances of any one type because of the capacity to spread once a gene 'escapes'. Although operating at the genetic rather than species level, we see some of the risks of GMOs to ecosystems as being similar to those associated with introduced species.

Indicator PRDOF **Collection** EVI 2004

Indicator # 220 **Sub-Index**

Indicator Name Productivity Overfishing

Units Fisheries catch in relation to productivity as the Productivity : Catch ratio. The greater the catch (t/sqkm EEZ/yr) in relation to productivity (t/sqkm shelf/yr) the more vulnerable the country to overfishing.

Reference Year 1994-1998

Source FAO 1993-1998 data (fisheries)
UBC (productivity)

Additional sources:

www.oae.go.th/statistic/yearbook/1998-99/ (Thailand); Cook Islands - Research & Economic Development (RED), Ministry of Marine Resources (MMR). Contact - Ian Bertram. MMR; Federated States of Micronesia - Department of Marine Development, Pohnpei State. Contact - Donald David. Department of Marine Development/ Head of Department; Fiji - 1994 Cabinet Paper "Fisheries Annual Report". Fisheries Department; Kiribati - Internal information from Fisheries Division Tanaea. Fisheries Statistics Unit. Contact - T Tebaitongo. Fisheries Division Tanaea; Kyrgyzstan - Department of State Ecological Control and Environment Utilization. Contact - Mr. Anarbekov Ruslan. Marine environment division / Deputy Director; Nauru - Nauru Fisheries and Marine Resources Authority(NFMRA). Contact - Peter Jacob (674 4443733/ 4443812/ peterjacob_nfmra@hotmail.com); Nepal - Country profile – Nepal 1999/2000. Directorate of Fisheries development, Balaju, Kathmandu; New Zealand - Fisheries assessment plenary's, research reports (various), returns from fisheries, electronic databases. Contact - Daniel Druce, Policy analyst, fisheries planning and co-ordination, ministry of fisheries, P O Box 1020, Wellington, New Zealand: E.Mail druced@fish.govt.nz ; Niue - A) Fisheries Resources Survey of the island of Niue, 1993. SPC. B)Niue 1999 Pelagic Fisheries Assessment; Palau - Contact - Theo Isamu (680 4885722/ 4883125/ theodmr@palaunet.com) Division of Marine Resources; Papua New Guinea - Status of Coral Reef Fisheries – Statistics, Fishing-gears and Impacts. Chapter 4. Anas, A; Kumoru, L. and Lokani, P. (Live Reef Fish Section); Samoa - A) Annual Report 1997/1998. Fisheries Division. B) An Assessment of the Subsistence and Artisanal Inshore Fisheries on Savaii, Western Samoa. 1997. Based on the Households Interview Questionnaire and Fishers Creel Surveys undertaken in 1990-91 and 1996-97. M. App. Sc. Thesis. Mulipola, A. P.; Thailand - Amnual Kongprom et al. (2000) Draft the Status of Demesal Fishery Resources of the Gulf of Thailand; Tonga - A) Report of the Minister for Fisheries for the Year 1997. Government of Tonga. B)

Report of the Minister for Fisheries for the Year 1998. Government of Tonga. C) Summary of Activities and Recommendations of SPC/ Tonga Ministry of Fisheries aquarium-fish management project (May 6-24, 1996). D) Biological Survey and Management of Mullet Resource in Tonga. 1995. Res. Bull. Tonga; Tuvalu - Sautia Maluofenua. Fisheries Department.

Methodology Average Ratio of Productivity : Fisheries Catch (tonnes Carbon/sqkm of EEZ/year) : (tonnes/sqkm Shelf area/year) over the last 5 years

1. This indicator does not measure overfishing of individual stocks in a country. Individual stocks may be highly vulnerable even where the overall biomass extracted is not high in relation to productivity. A low EVI score coupled with the loss of certain stocks may suggest that effort is too focused in a country and suggests investigations.

2. This indicator has been revised to better capture the rate of catch in relation to the ability of the environment to replenish the catch.

3. The previous text for this indicator was: "Percent of fisheries stocks over-fished (FAO definitions)". Although there are some FAO references to the state of the world's fisheries, which discuss the state of stocks, these data are not generally available for individual countries.

4. Tonnages on fisheries catch production were available from FAO for the years 1993 and 1998. We averaged the most recent 5 years (1994-1998).

5. Data on productivity were obtained from University of British Colombia (UBC). http://saup.fisheries.ubc.ca/eez/eez.aspx

6. Area of shelf was used as the density denominator for fisheries catches, but excludes lakes and other freshwater fisheries. These should be added.

7. Data on catches needs to consider whether they arise from within the country's EEZ, or outside.

Indicator PRDOFEVI **Collection** EVI 2004

Indicator # 221 **Sub-Index**

Indicator Name Productivity Overfishing (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1994-1998

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable PRODUCTIVITY OVERFISHING, the authors applied the following break off values (where X = fisheries catch in relation to productivity as the Productivity : Catch ratio):

EVI Score = 1 X >15
EVI Score = 2 14 < X ≤ 15
EVI Score = 3 13 < X ≤ 14
EVI Score = 4 12 < X ≤13
EVI Score = 5 11 < X ≤ 12
EVI Score = 6 10 < X ≤ 11

Rationale This indicator captures the risk of damage to fisheries stocks by examining rates of extraction in relation to the potential for the environment to replenish those stocks (productivity). We term this "ecological overfishing" or fishing beyond the capacity of the environment to replenish

stocks through primary production and biomass transfer. If the catch is high and productivity low, there is a higher risk that overall fisheries stocks can be depleted (all other factors being equal) than if the converse were the case. This indicator should be read in combination with Indicator 39 which focuses on catch per human effort. The effects of ecological overfishing would be especially important if there are interactions with other on-going human and natural impacts. A small P:C ratio means greater vulnerability of fisheries.

Indicator	FSHEF	**Collection**	EVI 2004
Indicator #	222	**Sub-Index**	

Indicator Name Fishing Effort

Units Density of fishers as mean annual number of fishers per km of coastline (last 5 years).

Reference Year 1994-1996

Source WRI 2000-2001

Additional sources:

www.apps.fao.org/fishery/fprod1-e.htm, www.apps.fao.org/page/form?collection=Fishery.Primary&Domain=Fishery&servlet=1&language=EN (Greece); Cook Islands - Contact - Ian Bertram, Director - Research & Economic Development(RED); Ministry of Marine Resources(MMR); Federated States of Micronesia - Contact - Donald Davis, Office of Economic Affairs/ Marine Development; Kiribati - Fisheries Statistics Unit. Contact - T. Tebaitongo. Fisheries Division; Marshall Islands - Marshall Islands Marine Resources Authority (MIMRA). Contact - Glen Joseph (Terry Keju's contact: 8262/ 5447/ MIMRA@ntamar.com); Nauru - Contact - Peter Jacob (674 4443733/ 4443812/ peterjacob_nfmra@hotmail.com). Nauru Fisheries and Marine Resources Authority (NFMRA)/ Acting CEO, Fisheries Division; New Zealand - Contact - Daniel Druce, Policy Analyst, Fisheries Planning and coordination, Ministry of fisheries, P O Box 1020, Wellington, New Zealand druced@fish.govt.nz; Niue - Niue 1999 Pelagic Fisheries Assessment. Department of Fisheries, Forestry and Agriculture(DAFF); Palau - Contact - Theo Isamu (680 4885722/ 4883125/ theodmr@palaunet.com). Department of Marine Resources; Papua New Guinea - Anas, A, Kumoru, L, and Lokano, P. Status of Coral Reef Fisheries – Statistics, Fishing-Gears and Impacts (Chapter 4, pp 24). (Live Reef Fish Section). PNG National Fisheries Authority; Philippines - National Statistical Coordination Board(NSCD), Philippine Asset Accounts. NSCD; Samoa - Contact - Anne Trevor. Fisheries Division, Ministry of Agriculture, Forests, Fisheries & Meteorology (MAFFM); Tonga - A) Annual Reports – Inshore Fisheries Statistics B) Report of the Minister for Fisheries 1997 & 1998 C) Results of the Field Surveys on Giant Clam Stock in the Tongatapu Island Group. 995. Tu'avao, T., Loto'ahea, T., Udagawa, K., and Sone, S. Fish. Res. Bull. Tonga, 3: 1-10. D) Open Culture of Giant Clam in Tonga: An Aspect of Managing Giant Clam Resources. 1995. Loto'ahea, T. and Sone, S. Fish Res. Bull. Tonga, 4: 25-30. E) Preliminary Report on the Biomass Study of Sea Cucumber in Ha'apai. Lokani, P., Matoto, S. V., and Ledua, E. F) Pilot Study of the Biology of the Sandfish in Tonga. 1993. Bobko, S., US Peace Corps Volunteer. Submitted to the Ministry of Lands, Survey and Natural Resources. (Ministry of Fisheries); Vanuatu - Contact - Kalo Pakoa (Moses Amos: 678 23119/ 23621; Wesley Obed: fax- 23641/ fishery@vanuatu.com.vu) Fisheries Department.

Methodology Average annual number of fishers per kilometre of coastline over the last 5 years.

1. This indicator has been revised to better capture the fishing pressure in a country.

2. Data on changes in catch per unit of effort (CPUE) over time, say percent change over 5 years, would be ideal for this indicator, but we were unable to find appropriate data to detect changes in CPUE.

3. Data on number of fishers is from WRI 2000-2001 but only incompletely covers years 1994-1996 (i.e. some years missing for most countries).

4. Numbers of fishers are available for landlocked countries, where the length of coastline is sometimes recorded as zero (see Indicator 11). In the future, lengths of lake coastlines and length of rivers may need to be added where this has been omitted for some countries, to allow for the calculation of values for this indicator.

Rationale This indicator captures the risk of damage to fisheries stocks through overcapacity of human effort. In this indicator we have tried to capture all fishers, not just the commercial fleet. Countries with large densities of fishers working their coastlines, including freshwater coasts such as lakes, are more likely to overfish their resources than those with lower densities. This indicator should be read in combination with Indicator 24, which focuses on ecological overfishing. The effects of overfishing would be especially important if there are interactions with other on-going human and natural impacts.

Indicator FSHEFEVI **Collection** EVI 2004

Indicator # 223 **Sub-Index**

Indicator Name Fishing Effort (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1994-1996

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable FISHING EFFORT, the authors applied the following break off values (where X = density of fishers as mean annual number of fishers per km of coastline (last 5 years)):

EVI Score = 1 $X \leq 2$
EVI Score = 2 $2 < X \leq 2.5$
EVI Score = 3 $2.5 < X \leq 3$
EVI Score = 4 $3 < X \leq 3.5$
EVI Score = 5 $3.5 < X \leq 4$
EVI Score = 6 $4 < X \leq 4.5$
EVI Score = 7 $X > 4.5$

Rationale This indicator captures the risk of damage to fisheries stocks through overcapacity of human effort. In this indicator we have tried to capture all fishers, not just the commercial fleet. Countries with large densities of fishers working their coastlines, including freshwater coasts such as lakes, are more likely to overfish their resources than those with lower densities. This indicator should be read in combination with Indicator 24, which focuses on ecological overfishing. The effects of overfishing would be especially important if there are interactions with other on-going human and natural impacts.

Indicator WATER **Collection** EVI 2004

Indicator # 224 **Sub-Index**

Indicator Name Renewable water

Units Water use as a percent of total renewable water (note this does not imply that any water used actually comes from renewable sources).

Reference Year 1991-1995

Source

WRI 2000-2001 for a single year between 1980 and 1995
Worldwater.org 2000

Additional sources:

www.mwa.or.th/~mevadept/stdata.html; UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Botswana - Botswana Rangeland, Inventory and Monitoring Project (BRIMP) Information System; Cook Islands - Second Water Utilities Databook, 1997. ADB. Waterworks, Marine Resources. Works, Energy and Physical Planning (MOWEPP); Costa Rica - Instituto Meteorológico Nacional, Departamentos de Aguas, 2002; Federated States of Micronesia - Contact - Robert Hadley, Department of TCLI; Fiji - Contact - Sadeesh Chand Maharaj (306177) Ministry of Health; Kiribati - Issues, Traditions and Conflicts in Groundwater Use and Management. Groundwater Recharge in Low Coral Islands Bonriki, South Tarawa, Republic of Kiribati. 1999. UNESCO-IHP Humid Tropics Programme. Water Research Foundation of Australia. Public Works Department (PWD); Kyrgyzstan - Department of State Ecological Control and Environment Utilization. Contact - Mrs. Neronova T.I, Unit of Water Resources and Air Protection; Marshall Islands - ADB TA # 1946 – RMI. Parson Engineering Science. Marshalls Water & Sanitation Conservation (MWSC); Nepal - State of Environment, Nepal, 2001, HMG-N / NORAD / UNEP / ICIMOD / SACEP, Kathmandu, Nepal; Niue - VIC GREEN. The Pacific Technical Assistance Facility (PACTAF) Contact - Andre' Siohane (683 4297/ 4223/ waterworks@mail.gov.nu) Public Works Department; Palau - Contact - Ann Kitalong (680 4886095/ ercpalau@hotmail.com) Office of Environmental Response and Coordination (OERC); Papua New Guinea - Contact - Maino Virobo (3250198/ 3250182). Hydrologist - Office of Environment & Conservation (OE & C); Samoa - Dorsch Consult. 1999. Apia Water Consolidation Project. Leak Detection Report. Samoa Water Authority; Singapore - Water department/ public utilities board; Thailand - www.pwa.thaigov.net/statistic.htm ; Tonga - Tonga Water Board's Records (Engineering Division). Contact - Lesieli Niu (676 23299/ 23518/ Lniutwb@kalianet.to) Chief Engineer; Vanuatu - Contact - John Chaniel (678 22211), BP 26, Port Vila. UNELCO Vanuatu Limited.

Methodology

Average annual water usage as percentage of renewable water resources over the last 5 years.

Average annual percentage of water usage per year met from renewable and non-declining sources over the last 5 years.

1. This proxy indicator does not show whether the water actually used by countries comes from renewable sources or whether it is mined. It shows only whether overall withdrawals exceed the available supply of renewable water. Countries may still be making the choice to mine their water from non-renewable sources.

2. Kuwait has no renewable water resources. It therefore has no value for the water use as % of renewable (would be □) and does not appear in the distributional analyses below. It was assigned an EVI=7 score.

3. The original form of the indicator, shown as 2 above, would be a better measure because it encompasses the choice of whether needs are being met from the available renewable resources.

Rationale

This indicator captures the risk to terrestrial environments, aquatic ecosystems and ground waters from over-extraction of freshwater resources. It focuses on sustainable use of surface free water and groundwater and damage through salinisation, extraction of functionally non-renewable groundwater, and damage to rivers, lakes and other habitats. Renewable water is that which is caught in rain tanks and reservoirs, or collected from streams, rivers, lakes, ice or groundwater sources that are not being diminished or salinised as a result of the extraction. The effects of over-extraction would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	WATEREVI	**Collection**	EVI 2004
Indicator #	225	**Sub-Index**	

Indicator Name Renewable Water (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1991-1995

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable WATER, the authors applied the following break off values (where X = water use as a percent of total renewable water (note this does not imply that any water used actually comes from renewable sources)):

EVI Score = 1 $X \leq 10$
EVI Score = 2 $10 < X \leq 20$
EVI Score = 3 $20 < X \leq 40$
EVI Score = 4 $40 < X \leq 60$
EVI Score = 5 $60 < X \leq 80$
EVI Score = 6 $80 < X \leq 100$
EVI Score = 7 $X > 100$

Rationale This indicator captures the risk to terrestrial environments, aquatic ecosystems and ground waters from over-extraction of freshwater resources. It focuses on sustainable use of surface free water and groundwater and damage through salinisation, extraction of functionally non-renewable groundwater, and damage to rivers, lakes and other habitats. Renewable water is that which is caught in rain tanks and reservoirs, or collected from streams, rivers, lakes, ice or groundwater sources that are not being diminished or salinised as a result of the extraction. The effects of over-extraction would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going

Indicator	SULPH	**Collection**	EVI 2004
Indicator #	226	**Sub-Index**	

Indicator Name Sulphur Dioxide Emissions

Units Sulphur dioxide emissions as tonnes/km2/year

Reference Year 1995

Source GEO-3 Data Compendium 2002
OECD 1999
WRI 2000-2001
HDR 1999
WDI 2001

Additional sources:

www.geocompendium.grid.unep.ch/data_sets/atmosphere/data/emissions_so2_total_rivm.htm (17/01/03); OECD 1999, pp 19; UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; United Nations Development Programme. 1999. Human Development Report. (pp 205 – 208) UNDP; World Development Indicators, 2001. (pp 174-175); Botswana - A) Annual Air pollution Reports B) Lankopane et al, 2002 Dispersion Model Calculations for BCL Limited Smelter in Selebi-Phikwe. C) Tshukudu. T and Knudsen. S, 1997 Dispersion calculations for BCL Limited Smelter in Selebi-Phikwe; Costa Rica - Resumen de Monitorie de Aire. Alfaro, M. del R., PECAires-Una,2002; Greece - Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kyrgyzstan - Department of State Ecological Control and Environment

Utilization. Contact - Mrs. Neronova T.I. Unit of Water Resources and Air Control, Chief; Niue - Niue Initial National Communication Report. Niue Meteorology Services; Singapore - Strategic planning and research department. Contact - Mr Adrian Tan, engineer (strategic planning) tel: 0065 67319710 E-Mail Adrian_tan@env.gov.sg; Thailand - Pollution Control Depratment, Thailand. Tel 66 2 2982253 Fax 66 2 2982240 E-mail: marinepollution_pcd@yahoo.com.

Methodology Average annual SO2 emissions (tonnes / sq km / yr) over the last 5 years.

1. This indicator was originally designed to measure ambient concentrations of SO2 in the country or in its largest city, but data were difficult to obtain.

2. We redefined the indicator to focus on emissions for which data are available for most countries. This proxy may not measure the conditions acting on a country if emissions tend to be exported and do not primarily act on the country producing the gases. Issues of the transboundary export of pollution and the resulting effects on countries receiving air pollution would be better assessed using the original form of the indicator, though the sources may not be readily identifiable.

3. Data are for 1995 only.

Rationale This indicator captures the risk to ecosystem health from air pollution, including its downstream effects. High rates of emissions of gases from industry present risks to all aspects of the environment through diffuse pathways, including deposition by rain. The effects of air pollution (of which SO2 is only one indicator and only one of the gases of concern) into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human

Indicator SULPHEVI **Collection** EVI 2004

Indicator # 227 **Sub-Index**

Indicator Name Sulphur Dioxide Emissions (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1995

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable SULPHUR, the authors applied the following break off values (where X = sulphur dioxide emissions as tonnes/km2/year):

EVI Score = 1 $X \leq 0.25$
EVI Score = 2 $0.25 < X \leq 0.5$
EVI Score = 3 $0.5 < X \leq 0.75$
EVI Score = 4 $0.75 < X \leq 1$
EVI Score = 5 $1 < X \leq 1.5$
EVI Score = 6 $1.5 < X \leq 2$
EVI Score = 7 $X > 2$

Rationale This indicator captures the risk to ecosystem health from air pollution, including its downstream effects. High rates of emissions of gases from industry present risks to all aspects of the environment through diffuse pathways, including deposition by rain. The effects of air pollution (of which SO2 is only one indicator and only one of the gases of concern) into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human

Indicator	WASTE	**Collection**	EVI 2004
Indicator #	228	**Sub-Index**	

Indicator Name Waste Production

Units Wastes produced and imported (including toxic, hazardous and municipal wastes) as X = mean tonnes per year per sq km of land.

Reference Year 1996-2000

Source EEA 2001 European Environment Agency
http://themes.eea.eu.int/Environmental_issues/waste/indicators/generation/w1_total_waste.pdf
UNEP 1998 http://www.unep.ch/basel/pub/table1.pdf
EPA http://www.zerowasteamerica.org/WasteTrade.htm
MZPSR Ministry of Environment of Slovak Republic 2000
http://www.sazp.sk/slovak/periodika/sprava/psreng/waste/waste_b_5.html

Additional sources:

www.themes.eea.eu.int/Environmental_isses/waste/indicators/generation/w1_total_waste.pdf (28/01/03); www.unep.ch/basel/pub/table1.pdf ; www.zerowasteamerica.org/WasteTrade.htm (29/01/2003); www.sazp.sk/slovak/periodika/sprava/psreng/waste/waste_b_5.html (28/01/03); Cook Islands Environment Service. Contact - Antoine Nia (682 21256/ 682 22256); Costa Rica - Municipalidad de San José, 2002; Federated States of Micronesia - Solid Waste Management Plan. WHO RS/ 91/ 0110/ OGAWA. Pohnpei State Environmental Protection Agency; Greece - Ministry of Environment and EU Stats; Kiribati - Waste Characterization Survey & Solid Waste Management Plan. Sinclair K Mertz. Suva, Fiji. Environment & Conservation Division (E&CD); Palau - Internal Solid Waste Management Plan. Golder Associates Ltd. Environmental Quality Protection Board (EQPB); Philippines - Metro Manila's Toxic and Hazardous Wastes, 1996. Environmental Management Bureau, Department of Environment and Natural Resources; Singapore - Lim Siak Heng: Tel 6731 9782 Fax : 67319651. Executive engineer Pollution Control Department (PCD); Thailand - Municipal solid waste management questionnaires/ Pollution Control Status Report. Pollution Control Dept. Ministry of Science, Technology and Environment; Trinidad &Tobago - Contact - June Ragbiringh-Chang; Tuvalu - Mertz, S K. 1999. Tuvalu National Environmental Management Strategy (NEMS). Environment Department.

Methodology Average annual net amount of generated and imported toxic, hazardous and municipal wastes per square kilometre land area over the last 5 years (t/km2/yr).

1. Data include wastes generated in each country in addition to those imported for storage or attenuation.

2. Wastes exported to other countries are specifically not included as a deduction in this indicator, so there will be double-accounting of wastes because where they appear in one country as generated, they may also appear in another as imported. We believe this a better measure of vulnerability.

3. Data from in-country sources were difficult to obtain.

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from toxic and municipal wastes. All such wastes need a suitable area of land or volume of water for their eventual attenuation. High waste loads present risks to all aspects of the environment. The effects of dumping large amounts of wastes into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator WASTEEVI **Collection** EVI 2004

Indicator # 229 **Sub-Index**

Indicator Name Waste Production (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable WASTE, the authors applied the following break off values (where wastes produced and imported (including toxic, hazardous and municipal wastes) as X = mean tonnes per year per sq km of land):

EVI Score = 1 $X \leq 1$
EVI Score = 2 $1 < X \leq 2$
EVI Score = 3 $2 < X \leq 3$
EVI Score = 4 $3 < X \leq 4$
EVI Score = 5 $4 < X \leq 5$
EVI Score = 6 $5 < X \leq 6$
EVI Score = 7 $X > 6$

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from toxic and municipal wastes. All such wastes need a suitable area of land or volume of water for their eventual attenuation. High waste loads present risks to all aspects of the environment. The effects of dumping large amounts of wastes into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator TRTMNT **Collection** EVI 2004

Indicator # 230 **Sub-Index**

Indicator Name Waste Treatment

Units Average annual percentage of wastes produced that undergo treatment that limits negative effects on the environment.

Reference Year 1992-1998

Source Eurostat http://www.waste.eionet.eu.int

Additional sources:

www.waste.eionet.eu.i/results_html?country=all&dataset=2&sector=All%20sectors&year=a (21/1/03); Botswana - Department of Sanitation and Waste Management. Contact - Mr S. Pathmanathan. Phone: 3900076. Fax: 3909953. spathmanathan@gov.bw ; Cook Islands - Contact - Antoine Nia (682 21256/ 682 22256). Environment Services; Federated States of Micronesia - Solid Waste Management Plan. WHO RS/ 91/ 0110/ OGAWA. Pohnpei State Environmental Protection Agency; Kiribati - Waste Characterization Survey & Solid Waste Management Plan. Sinclair K Mertz. Suva, Fiji. Environment & Conservation Division (E&CD); Marshall Islands - Crawford, M. 1992 RMI National Environmental Management Strategy (NEMS) Part A, (pp 51); Niue - Waste Management Plan – Niue. Draft, 2000. Community Affairs; Palau - Internal Solid Waste Management Plan. Golder Associates Ltd. Environmental Quality Protection Board (EQPB); Papua New Guinea - Solid Waste Characterisation Study and Management Plan for Port Moresby, PNG Country Report. Office of Environment & Conservation (OE & C); Singapore - Lim Siak Heng: Tel 6731 9782 Fax : 67319651. Executive engineer Pollution Control Department (PCD); Thailand - Pollution Control Department. Thailand.

Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com; Tuvalu - Environment Department. Contact – Mataio. Environment Dept; Vanuatu - Mertz, S. K. Solid Waste Characterization & Management Plan Study. Port Vila Municipality.

Methodology Mean annual percent of hazardous, toxic and municipal waste effectively managed and treated over the past 5 years.

1. Effectively managed wastes are composted, reused, recycled, subjected to controlled incineration (including temperature control, retention time control and control of emissions), and/or placed in controlled landfill (involving treatment of leachate, containment, gas management, aftercare and rehabilitation i.e. recovery, planting and post management).

Rationale Proportion of wastes rendered less harmful. This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from toxic and municipal wastes and how they are treated. All wastes need a suitable area of land or volume of water for their eventual attenuation, but treatment and recycling are effective means of reducing the overall waste load in a country. High waste loads present risks to all aspects of the environment. The effects of dumping large amounts of wastes into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator TRTMNTEVI **Collection** EVI 2004

Indicator # 231 **Sub-Index**

Indicator Name Waste Treatment (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable TREATMENT, the authors applied the following break off values (where X = average annual percentage of wastes produced that undergo treatment that limits negative effects on the environment):

EVI Score = 1 $X = 100$
EVI Score = 2 $80 \leq X < 100$
EVI Score = 3 $60 \leq X < 80$
EVI Score = 4 $50 \leq X < 60$
EVI Score = 5 $40 \leq X < 50$
EVI Score = 6 $30 \leq X < 40$
EVI Score = 7 $X < 30$

Rationale Proportion of wastes rendered less harmful. This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from toxic and municipal wastes and how they are treated. All wastes need a suitable area of land or volume of water for their eventual attenuation, but treatment and recycling are effective means of reducing the overall waste load in a country. High waste loads present risks to all aspects of the environment. The effects of dumping large amounts of wastes into the environment and beyond its capacity to attenuate them would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	INDUST	**Collection**	EVI 2004
Indicator #	232	**Sub-Index**	

Indicator Name Industry

Units Tonnes of oil equivalent (toe) per year per sq km of land.

Reference Year 1997

Source WRI 2000-2001

Additional sources:

www.world-nuclear.org (16/7/02); www.diw.go.th/ Report on Control of Waste Discharged from Oil and Gas Exploration and Production in the Gulf of Thailand, Pollution Control Dept (2001) (Thailand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Cook Island - Bureau of Statistics Information – Census 1998. Environment Services; Federated States of Micronesia - FSM DEA, and Department of Health, Education and Social Affairs (DHESA). Contact - Eneriko Suldan , and Moses Petrick (691 3202619/ 691 3205263/ Fsmhealth@mail.fm). FSM DEA/ Assistant Secretary; DHESA/ Environmental Health Specialist; Fiji - Vandana Naidu (311 699). Department of Environment (DoE); Greece - Various sources. Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Contact - Michael Phillips. Environment & Conservation Division (E&CD); Kyrgyzstan - Department of State Ecological Control and Environment Utilization. Conatct - Mr Myrsaliev. Unit of Conventions; Nauru - Nauru Rehabilitation Corporation (NRC) Contact - Dempsey Detenamo (674 4443220/ 4443272/ detenamo@yahoo.com); Palau - Permit Files. Environmental Quality Protection Board (EQPB). Contact - Robert (Bob) Marek (680 4881639 or 3600/ 4882963/ eqpb@palaunet.com); Papua New Guinea - Data provided by: Katrina Solien (674 3250194, 3250113). Assistant Manager, Office of Environment & Conservation (OE & C); Republic of Marshall Islands - Republic of Marshall Islands Environmental Protection Agency (RMI EPA) Employees. Contact - Deborah Barker (Yumie Crisostomo's contact: 3035/ 5203/ EPARMI@ntamar.com/ Yumic@hotmail.com)
Samoa - Lands, Surveys & Environment. Contact - Vainuupo Jungblut (685 22481 or 22486/ 23176/ envdlse@samoa.net); Singapore - Lim Siak Heng: Tel 6731 9782 Fax : 67319651. Executive engineer Pollution Control Department (PCD); St Lucia - Sustainable development and environment department. Contact - Christopher Corbin Tel: 7584685041 Fax - 7854516958 E-Mail ccorbin@planning.gove.lc. Senior sustainable development + Environment officer; Tonga - Environmental Planning & Conservation Section (EPACS) Contact - Lupe Matoto (676 23611/ 23216/ imepacs@candw.to, Vailala@candw.to) EPACS; Tuvalu - Environment Department. Contact – Mataio. Environment Dept; Vanuatu - Contact - Ernest Bani (678 25302/ 23565). Environment Unit/ Principal Environment Officer.

Methodology Average annual use of electricity for industry over the last 5 years per square kilometre of land.

1. The new form of this indicator uses the proxy of electricity use for industry because information on numbers of relevant industries was difficult to obtain for a large number of

Rationale This indicator captures all major potential chemical and other industrial polluters that could cause significant environmental damage from accidents and diffuse pollution, including acid rain, not normally recorded as part of waste streams. It also captures electricity generation and/or use specifically for purposes of industry, which in itself has ecological consequences. This indicator is used to take into account accidents such as the Bhopal chemical explosion in India, as well as incidents such as the Chernobyl and more recently the Japanese nuclear disaster. The effects of industrial accidents and diffuse pollution would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	INDUSTEVI	**Collection**	EVI 2004
Indicator #	233	**Sub-Index**	

Indicator Name Industry (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1997

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable INDUSTRY, the authors applied the following break off values (where X = tonnes of oil equivalent (toe) per year per sq km of land):

EVI Score = 1 $X \leq 5$
EVI Score = 2 $5 < X \leq 10$
EVI Score = 3 $10 < X \leq 20$
EVI Score = 4 $20 < X \leq 50$
EVI Score = 5 $50 < X \leq 100$
EVI Score = 6 $100 < X \leq 200$
EVI Score = 7 $X > 200$

Rationale This indicator captures all major potential chemical and other industrial polluters that could cause significant environmental damage from accidents and diffuse pollution, including acid rain, not normally recorded as part of waste streams. It also captures electricity generation and/or use specifically for purposes of industry, which in itself has ecological consequences. This indicator is used to take into account accidents such as the Bhopal chemical explosion in India, as well as incidents such as the Chernobyl and more recently the Japanese nuclear disaster. The effects of industrial accidents and diffuse pollution would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	SPILLS	**Collection**	EVI 2004
Indicator #	234	**Sub-Index**	

Indicator Name Spills

Units Number of spills greater than 1,000 litres between 1996-2000.

Reference Year 1996-2000

Source ITOPF 2002 International Tanker Owners Federation - Refers to oil spills at sea only SPILLS 2000 www.etcentre.org/spills. The source of the spill must be a vessel, generally a tanker or barge on which a petroleum product was cargo, and must involve at least 1000 barrels (42,000 gallons).
CRED 2000 The OFDA/CRED International disaster database: data source derived from LLOYDS CAS

Additional sources:

www.itopf.com/country_profiles/profiles/view.html (16/01/03); www.cred.be/emdat/guide.htm (19/03/2002), www.etcentre.org/spills ; Cook Islands - Contact - Antoine Nia (682 21256/ 682 22256). Environment Services; Costa Rica - Direccion saniamiento ambiental. Municipalidad de San Jose; Federated States of Micronesia - Gawel, M. 1993. FSM SoE. (pp 34-35). SPREP; Fiji - Fiji National Oil Spill Committee. National Fire Authority (NFA) Sher Bahadur - NFA/ Secretary; Kiribati - Contact - Yale Carden. Environment & Conservation Division (E&CD); Kyrgyzstan - Department of State Ecological Control and Environment Utilization. Contact - Mr Myrsaliev. Unit of Conventions; Marshall Islands - A) Crawford, M. 1992. RMI National Environmental Management Strategy (NEMS), B) Republic of Marshall Islands Environmental Protection

Agency (RMI EPA) Employees; Nauru - Nauru Phosphate Corporation (NPC). Contact - David De-Luckner (NPC); Nepal - Office Records. Nepal Oil Corporation, Kathmandu; Niue - Country Report for UNCED – Niue, 1991. Government of Niue & SPREP (Consultants – Lowry, C & Smith, J). pp 53. EVI Team; Niue - Data based on first-hand knowledge and experience. Bulk Fuel Corporation(BFC). Contact - Berry Sofaea (fax: 683 4362/ bulkfuel@mail.gov.nu). BFC Terminal Supervisor; Palau - Conversation with Emil Edesomel, Pollution Prevention Officer. Environmental Quality Protection Board (EQPB); Samoa - Report on Oil Spill (July 1999) based on observation and investigation. Lands, Surveys & Environment; Singapore - Lim Siak Heng: Tel 6731 9782 Fax : 67319651. Executive engineer Pollution Control Department(PCD); Thailand - Pollution Control Department. Thailand. Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com; Tonga - 1994 - 1999 Annual Report. Ministry of Marine & Ports (MMP); Tuvalu - Environment Department. Contact – Mataio. Environment Dept.

Methodology Total number of spills of oil and hazardous substances greater than 1000 litres on land, in rivers or within territorial waters per million km maritime coast during the last five years

1. Two countries, Kyrgyzstan and Kazakhstan recorded spills during the period 1996-2000 but do not have maritime coasts.

Rationale This indicator captures the risk to marine, estuarine, riverine, lake, ground water and terrestrial ecosystems from spills of hydrocarbons and other toxic fluids. Only spills greater than 1,000 litres are included. The effects of spills of toxic chemicals are of special significance for endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator SPILLSEVI **Collection** EVI 2004

Indicator # 235 **Sub-Index**

Indicator Name Spills (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable SPILLS, the authors applied the following break off values (where X = number of spills greater than 1,000 litres between 1996-2000):

EVI Score = 1 $X = 0$
EVI Score = 2 $0 < X \leq 50$
EVI Score = 3 $50 < X \leq 100$
EVI Score = 4 $100 < X \leq 150$
EVI Score = 5 $150 < X \leq 200$
EVI Score = 6 $200 < X \leq 250$
EVI Score = 7 $X > 250$

Rationale This indicator captures the risk to marine, estuarine, riverine, lake, ground water and terrestrial ecosystems from spills of hydrocarbons and other toxic fluids. Only spills greater than 1,000 litres are included. The effects of spills of toxic chemicals are of special significance for endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	MINING	**Collection**	EVI 2004
Indicator #	236	**Sub-Index**	

Indicator Name Mining

Units Average total mining production 1996-2000 in tonnes/ km2/year.

Reference Year 1996-2000

Source USGS - US Geological Survey and are mean annual production 1996-2000
World Nuclear Association 2003 web site - http://www.world-nuclear.org/info/inf23.htm
Diamond Registry 2002 -- http://www.diamondregistry.com/News/2002/production.htm
Salt Institute 2002 - http://www.salt.org.il/frame_prod.html (data from USGS Mineral Commodity Summaries 2002)
Uranium is only from 2000

Addiitional sources:

www.diamondregistry.com/News/2002/production.htm; www.world-nuclear.org/info/inf23.htm; www.salt.org.il/frame_prod.html; www4.btwebworld.com/mineralsuk/britmin/AMS1995-99.pdf (29/01/03); www.minerals.er.usgs.gov/minerals/pubs/country/2001/; Botswana - Contact - Mr. N.C MmolawaTel: 365 7000 Fax: 352141 nmmolawa@gov.bw Department of Mines Senior Mining Engineer; Federated States of Micronesia - Contact - Eneriko Suldan. FSM Department of Economic Affairs (FSMDEA); Fiji - SML (B) Files: Form 13 & 14 Monthly Reports. Minerals Resources Department (MRD); Kiribati - Contact - Naomi Atauea (686 21099/ 686 21120) Ministry of Natural Resources Development (MNRD); Kyrgyzstan - Department of State Ecological Control and Environment Utilization. Contact - Mr. Myrsaliev N, Unit Of Conventions; Marshall Islands - Contact - J. Kramer (Kenneth Kramer's contact: 3560/ 3348/ Kkramer@ite.net) Pacific International (Construction) Inc.; Nauru - Shipment data; Niue - Contact - DeveTalagi (Fax: 4223). Public Works Department/ Director; Papua New Guinea - Annual Mining Estimates. Mining Division; Philippines - Environmental Degradation due to Selected Economic Activities. Minerals and Mining Sector, PEENRA; Samoa - Contact - Vainuupo Jungblut. Lands, Surveys & Environment; Thailand - Mineral Statistic of Thailand 1996-2000. Department of Mineral Resource; Tuvalu - Mc Lean, R. F. and Hosking, P. C. 1991. Tuvalu Land Resource Survey Report. Country Report. A report prepared for the Food and Agriculture Organisation of the United Nations acting as executing agency for the United Nations Development Programme.

Methodology Average annual mining production over the past 5 years (includes all surface and subsurface mining and quarrying) (tonnes/km2/yr).

Tonnes of mining material (ore + tailings) extracted from sub-surface mines per square kilometre per land area per year average last five years. Include all metals, oil, coal and any other non-renewables extracted through sub-surface mining.

1. Data are on average annual production between 1996-2000 for most products, except Uranium for which data for only the year 2000 were available.

2. Data includes 81 types of mining, including clays, gravels, cement, gems, radioactive materials, metals, petroleum and gas.

3. Production is not the best measure for this indicator. We designed the indicator to measure the total amount of ores extracted, not just the much smaller amounts of final products taken from them. Ore extraction is considered a better measure of environmental disturbance for two reasons. First, it measures the level of general physical disturbance of the environment, regardless of the value or volume/weight of the final product of interest. Second, the amount of ore extracted may be self-weighting. That is, for large volume/weight materials such as stone, cement, gravels etc, the amount of material extracted is approximately equal to the final product (except for overburden) and therefore represents mostly the physical disturbance. For heavy metals, the amount of ore extracted is much larger than the weight of the final

product. In this case, using the value for ore builds-in a stronger signal than just final production figures, the difference representing some measure of the effects of processing the ore to the final concentrate.

4. Data from in-country sources were difficult to obtain.

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from the effects of ecosystem disturbance, accidents, oil spills and toxic leachates, and processing from mining of all kinds. All disturbance can lead to vulnerability to other processes, human and natural, and wastes need a suitable area of land or volume of water for their eventual attenuation or long term deposition. High levels of mining activity present risks to all aspects of the environment. The effects of mining would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator MININGEVI **Collection** EVI 2004

Indicator # 237 **Sub-Index**

Indicator Name Mining (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable MINING, the authors applied the following break off values (where X = average total mining production 1996-2000 in tonnes/km2/yr):

EVI Score = 1 $X \leq 1$
EVI Score = 2 $1 < X \leq 2$
EVI Score = 3 $2 < X \leq 3$
EVI Score = 4 $3 < X \leq 4$
EVI Score = 5 $4 < X \leq 5$
EVI Score = 6 $5 < X \leq 6$
EVI Score = 7 $X > 6$

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters from the effects of ecosystem disturbance, accidents, oil spills and toxic leachates, and processing from mining of all kinds. All disturbance can lead to vulnerability to other processes, human and natural, and wastes need a suitable area of land or volume of water for their eventual attenuation or long term deposition. High levels of mining activity present risks to all aspects of the environment. The effects of mining would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator SAN **Collection** EVI 2004

Indicator # 238 **Sub-Index**

Indicator Name Sanitation

Units Percent of human population with access to safe sanitation, converted to percent without access and then a density of population per km2.

Reference Year 1990-1997

Source

WRI 2000-2001 (using WHO definitions)

Additional sources:

www.nso.go.th/pop2000/table/tadv_tab13.xls (Thailand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Botswana - CSO, 2001 Population Census. Department of Sanitation, National Master Plan; Cook Islands - A) Water and Sanitation in the South Pacific. 1998 Report. B) Pacific Human Development Report, 1999. SP Epidemiological Implementation. (Statistics Office); Costa Rica - Instituto Nacional de Estadística y Censos, Encuesta de Hogares de Propósitos Múltiples. Módulo de Vivienda; Kiribati - A) Environmental Health Staff. B) National Statistics Office. Ministry of Health and Family Planning; Kyrgyzstan - Source - Inspectorate of Sanitation and Epidemiological Control. Contact - Mrs. Vashneva N.S. Leading Specialist; Marshall Islands - Marshalls Water & Sanitation Conservation (MWSC) Billing; Nauru - Contact - Dempsey Detenamo (674 4443220/ 4443272/ detenamo@yahoo.com) Nauru Rehabilitation Corporation; Nepal - State of the Environment, Nepal, 2001 (p-46) Ministry of Population and Environment, Kathmandu; New Zealand - Community sewerage survey- Prepared for the ministry of health, February 2001, by Beca Steven in association with the institute of Environmental Science and research Ltd. Ministry of Health; Niue - Contact - Water Division, PWD. Andre Siohane (683 4297/ 4223/ waterworks@mail.gov.nu); Palau - Census of Population & Housing. Office of Planning & Statistics; Papua New Guinea - Source - Department of Health, Community Health, Water Supply & Sanitation. Contact - Maino Virobo (3250198/ 3250182). OE & C/ Hydrologist; Philippines - Source - Modified Field Health Service Information System. Contact - Mr. Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph Statistical Coordination Officer. Environmental Health Service, Department of Health; Singapore - Source - Sewerage department. Contact - Sandra Joy Vaz, Tel: 7313110 : Fax 7313020 E-Mail Sandra_Vaz@pub.gov.sg. Director, corporate management department; Trinidad & Tobago - Contact - Cindy Buchoon.

Methodology

Density of population without access to safe sanitation (WHO definitions).

Density of population without access to secondary or higher levels of sewage treatment.

1. The original indicator text was converted to a density function and reversed from a focus part of the population with sanitation (text 3), to focus on part without sanitation for a more relevant and intuitive EVI scale.

2. This scale is set more critically than that on population density because it focuses on populations without access to safe sanitation and which may therefore be more likely to release untreated pollutants into the surrounding environment.

3. A better form of this indicator would be the population without access to at least secondary sewage treatment (text 2 above). That is, at least partial bacterial breakdown of sewage before it is released into the environment.

Rationale

'Safe sanitation' is normally an issue seen from a human perspective. It deals with hygiene, disease control and direct quality of life for humans. We are using this information for the EVI from and environmental perspective. This indicator (text 1 above) is a proxy measure for how human waste is treated before it enters the environment. We are taking safe sanitation as an indication of at least some pre-treatment of sewage before it enters stream, groundwater recharge, coastal and land areas. If sanitation is of a low standard, ecosystems downstream have a higher risk of being polluted with sewage that has not been broken down and which will contain high levels of urea, ammonia, nitrites, pharmaceuticals and pathogens. The WHO definition of safe sanitation used here is the percentage of the human population with sewage disposal facilities that can effectively prevent human, animal, and insect contact. This includes connections to public sewers, household systems such as pit and pour-flush latrines, septic tanks, communal toilets, and other such facilities.

Indicator SANEVI **Collection** EVI 2004

Indicator # 239 **Sub-Index**

Indicator Name Sanitation (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1990-1997

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable SANITATION, the authors applied the following break off values (where X = percent of human population with access to safe sanitation, converted to percent without access and then a density of population per km2):

EVI Score = 1 $X < 1.5$
EVI Score = 2 $1.5 < X \leq 2$
EVI Score = 3 $2 < X \leq 2.5$
EVI Score = 4 $2.5 < X \leq 3$
EVI Score = 5 $3 < X \leq 3.5$
EVI Score = 6 $3.5 < X \leq 4$
EVI Score = 7 $X > 4$

Rationale 'Safe sanitation' is normally an issue seen from a human perspective. It deals with hygiene, disease control and direct quality of life for humans. We are using this information for the EVI from and environmental perspective. This indicator (text 1 above) is a proxy measure for how human waste is treated before it enters the environment. We are taking safe sanitation as an indication of at least some pre-treatment of sewage before it enters stream, groundwater recharge, coastal and land areas. If sanitation is of a low standard, ecosystems downstream have a higher risk of being polluted with sewage that has not been broken down and which will contain high levels of urea, ammonia, nitrites, pharmaceuticals and pathogens. The WHO definition of safe sanitation used here is the percentage of the human population with sewage disposal facilities that can effectively prevent human, animal, and insect contact. This includes connections to public sewers, household systems such as pit and pour-flush latrines, septic tanks, communal toilets, and other such facilities.

Indicator VEH **Collection** EVI 2004

Indicator # 240 **Sub-Index**

Indicator Name Vehicles

Units Vehicles in a country per sq km of land

Reference Year 1996

Source WRI 2000-2001
OECD 1999

Additional sources:

UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.
WRI 1998-1999.; OECD 1999; Botswana - Transport and communications Statistics, 2000. Central statistics Office; Cook Islands - 1996 Census of Population & Dwelling. Statistics Office, Ministry of Finance and Economic Management (MFEM); Costa Rica - Ministerio de Obras Públicas y Transportes; Federated States of Micronesia - FSM 1999 Statistical Yearbook. FSM Department of Economic Affairs (FSMDEA); Fiji - Fiji Bureau of Statistics; Greece - Greek Monthly Statistics Bulletin, June 2001. Greek Government Statistics; Kiribati - Statistics Office. Contact - Reeiti Takaria (686 21816/ 686 21272); Kyrgyzstan - The National

Report on Environment Conditions for 1998-1999; Marshall Islands - RMI Statistical Abstract. Contact - Jefferson Butuna's contact: 3802/ 3805/ planning@ntamar.com. - Office of Planning and Statistics(OPS)/ Director; Nauru - Climate Change – Response. Republic pf Nauru Response, 1999 (pp 2). Adapted from Nauru Census, 1992). SOPAC (Energy Unit); Nepal - Statistical pocket book, Nepal, 2000. Department of Central Bureau of Statistics, Kathmandu, Nepal; Niue - Niue Police Station. Contact - Margaret Siosikefu (683 4219/ 4143/ stats.epdsu@mail.gov.nu), Niue Statistics; Palau - Department of Motor Vehicles/ Ministry of Justice; Philippines - National Statistical Coordination Board, Philippine Statistical Yearbook. Land Transportation Office; Samoa - Annual Statistics Abstract, 1998. Statistics Department; Singapore - Land Transport authority, management services Dept, CPI's. Contact - Ong Eng Chin (Mc) Policy officer DID 63757088 E-Mail: eng_chin_oya@lta.gov.sg. Policy / policy officer; St Lucia - Compendium of Environmental statistics. Road transport division, ministry of communications, works, transport and pub. Utilities; Thailand - www.motc.go.th/ (6/6/01); Tonga - Annual Trade Report 1995 - 1999. Statistics Department; Trinidad & Tobago - Contact - Karen Ragoonanan; Tuvalu - Town Council Vehicle Register. Funafuti Town Council.

Methodology Number of vehicles per square kilometre of land area (most recent data)

1. Data from WRI only cover 1996

Rationale This indicator captures the risk to terrestrial ecosystems in the form of habitat damage, habitat fragmentation, loss of biodiversity, pollution hazardous wastes and industries, including air and lead pollution on land and in waterways. Of particular concern is fragmentation of the countryside which can interfere with normal movements and/or migration of terrestrial mammals. The definition of vehicles used here is from the World Bank. The effects would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator VEHEVI **Collection** EVI 2004

Indicator # 241 **Sub-Index**

Indicator Name Vehicles (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable VEHICLES, the authors applied the following break off values (where X = vehicles in a country per sq km of land):

EVI Score = 1 $X \leq 1$
EVI Score = 2 $1 < X \leq 1.5$
EVI Score = 3 $1.5 < X \leq 2$
EVI Score = 4 $2 < X \leq 2.5$
EVI Score = 5 $2.5 < X \leq 3$
EVI Score = 6 $3 < X \leq 3.5$
EVI Score = 7 $X > 3.5$

Rationale This indicator captures the risk to terrestrial ecosystems in the form of habitat damage, habitat fragmentation, loss of biodiversity, pollution hazardous wastes and industries, including air and lead pollution on land and in waterways. Of particular concern is fragmentation of the countryside which can interfere with normal movements and/or migration of terrestrial mammals. The definition of vehicles used here is from the World Bank. The effects would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	POPDN	**Collection**	EVI 2004
Indicator #	242	**Sub-Index**	
Indicator Name	Population Density		
Units	Total human population/sq km.		
Reference Year	2000-2001		
Source	WRI 2000-2001 CIA Fact sheets 2001 Additional sources: www.stats.govt.nz (New Zealand); www.nso.go.th/pop2000/summary.htm (20/7/01) (Thailand); www.bartleby.com/151/a21.html (CIA The World Fact Book.) (20/02/2002); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Botswana - Miss Minkie Pheto, 352200 Phone, 352201 Fax, mmpheto@gov.bw Statistician, Environment Statistics Unit; Cook Islands - Annual Statistical Bulletin, June 2000. Statistics Office; Costa Rica - Observatorio del desarrollo; Federated States of Micronesia - FSM 1994 Census Report/ FSM 1999 Statistical Yearbook. FSM Department of Economic Affairs; Fiji - 1996 Population & Housing Census (General tables) Bureau of Statistics; Greece - Greek Government Statistics; Kiribati - Report on the 1995 Census of Population, Volume 1: Basic Information & Tables. Bureau of Statistics; Kyrgyzstan - National Statistics Committee; Nauru - Nauru Census, 1992. Bureau of Statistics; Nepal - Department of Central Bureau of Statistics, Kathmandu, Nepal; Niue - Niue Household Listing Report 9 –10 October 1999. Niue Statistics; Palau - Census of Population & Housing, 2000. Office of Planning and Statistics; Papua New Guinea - Report on 1990 National Population and Housing Census in PNG. National Statistics Office; Philippines - Contact - Mr. Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph. Statistical Coordination Officer. National Statistics Office; Republic of the Marshall Islands - Republic of the Marshall Islands(RMI) Statistical Abstract. Contact - Jefferson Butuna: 3802/ 3805/ planning@ntamar.com Office of Planning and Statistics; Samoa - Population Census 1991. (pp 16) Statistics Department; Tonga - Population Census 1996: A) Administrative and General Tables B) Household Analyses. Statistics Department, Tonga; Tuvalu - Tuvalu Population & Housing Census, 1991. Central Statistics Division.		
Methodology	Total human population density (number per km2 land area).		
Rationale	This is a proxy measure for pressure on the environment resulting from the number of humans being supported per unit of land. The greater numbers of people increases pressure on the environment for resources, for the attenuation of wastes and physical disturbance of the environment.		

Indicator	POPDNEVI	**Collection**	EVI 2004
Indicator #	243	**Sub-Index**	
Indicator Name	Population Density (scaled)		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2000-2001		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	Using the variable DENSITY, the authors applied the following break off values (where X = total human population/sq km):		

EVI Score = 1 X < 3
EVI Score = 2 3 < X ≤ 3.5
EVI Score = 3 3.5 < X ≤ 4
EVI Score = 4 4 < X ≤ 4.5
EVI Score = 5 4.5 < X ≤ 5
EVI Score = 6 5 < X ≤ 5.5
EVI Score = 7 X > 5.5

Rationale This is a proxy measure for pressure on the environment resulting from the number of humans being supported per unit of land. The greater numbers of people increases pressure on the environment for resources, for the attenuation of wastes and physical disturbance of the environment.

Indicator POPGRTH **Collection** EVI 2004

Indicator # 244 **Sub-Index**

Indicator Name Population Growth

Units Average percent yearly change in population (1996-2001)

Reference Year 1996-2001

Source WRI 2000-2001
U.S. Bureau of Census - International Data Base

Additional sources:

www.stats.govt.nz (New Zealand); www.forest.go.th/stat42/stat.htm (7/6/01)(Thailand); www.bartleby.com/151/a23.html (CIA: The World Fact Book, 2001)(26/02/2002); www.census.gov/ipc/www/idbrank.html (US Census Bureau); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Botswana - Source - Central statistics Office. Contact - Ms Sarah Kabaija Phone - 352200; Fax - 352201; Email - skabaija@gov.bw ; Cook Islands - Annual Statistics Bulletin, 2000. Statistics Office; Costa Rica - GEO, Estadísticas Ambientales de América Latina y del Caribe, Observatorio del Desarrollo 2001; Federated States of Micronesia - 1994 FSM Census Report. FSM Department of Economic Affairs; Fiji - A) 1996 Census B) other estimations. Bureau Of Statistics; Greece - Greek Government Statistics; Kiribati - Report on the 1995 Census of Population, Volume 1: Basic Information & Tables. Bureau of Statistics; Kyrgyzstan - Department of Statistics; Nauru - Year 2000 Pocket Statistical Summary, South Pacific Commission. EVI Team; Nauru - Year 2000 Pocket Statistical Summary, South Pacific Commission; Nepal - Statistical Year book, Various Issues, Nepal. Department of Central Bureau of Statistics, Nepal; Niue - 1999 Census. Niue Statistics; Palau - 1999 Statistical Yearbook, 1995 & 2000 Census; Papua New Guinea - Report on 1990 National Population and Housing Census in PNG. National Statistics Office; Philippines - National Statistics Office/National Statistical Coordination Board. Contact - Mr. Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph ; Republic of the Marshall Islands - Republic of the Marshall Islands(RMI) Statistical Abstract. Contact - Jefferson Butuna: 3802/ 3805/ planning@ntamar.com Office of Planning and Statistics; Samoa - Annual Statistics Abstract 1998 (pp 4). Statistics Department; Singapore - Yearbook of statistics, Singapore 2001 Census of population 2000, advance data releaseCensus of population 2000, statistical release 1-5. Singapore department of statistics; Tonga - Population Census (1996) Demographic Analysis. Statistics Department; Tuvalu - Tuvalu Population & Housing Census, 1991. Central Statistics Division.

Methodology Annual human population growth rate over the last 5 years

This indicator focuses on the potential for damage relating to expanding human populations. It signals increasing rates of habitat damage, exploitation of natural resources and disposal of wastes that will need to be assimilated into the environment. It also captures the risk of

infrastructure not being able to keep up with demand for issues such as waste treatment.

Rationale This indicator focuses on the potential for damage relating to expanding human populations. It signals increasing rates of habitat damage, exploitation of natural resources and disposal of wastes that will need to be assimilated into the environment. It also captures the risk of infrastructure not being able to keep up with demand for issues such as waste treatment.

Indicator POPGRTHEVI **Collection** EVI 2004

Indicator # 245 **Sub-Index**

Indicator Name Population Growth (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1996-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable GROWTH, the authors applied the following break off values (where X = average percent yearly change in population (1996-2001)):

EVI Score = 1 $X < 0$
EVI Score = 2 $X = 0$
EVI Score = 3 $0 \leq X < 0.5$
EVI Score = 4 $0.5 \leq X < 1$
EVI Score = 5 $1 \leq X < 1.5$
EVI Score = 6 $1.5 \leq X < 2$
EVI Score = 7 $2 \leq X$

Rationale This indicator focuses on the potential for damage relating to expanding human populations. It signals increasing rates of habitat damage, exploitation of natural resources and disposal of wastes that will need to be assimilated into the environment. It also captures the risk of infrastructure not being able to keep up with demand for issues such as waste treatment.

Indicator TOUR **Collection** EVI 2004

Indicator # 246 **Sub-Index**

Indicator Name Tourists

Units Mean number of international tourists x number of days stayed divided by area of land (sq km).

Reference Year 1996-2000

Source WTO (World Trade Organisation) web site
In-country tourist boards and EVI collaborators

Additiional sources:

www.world- tourism.org/market_research/facts&figures/statistics/t_ita00country.pdf (13/12/02); www.czso.cz/eng/figures (28/11/02) (Brunei Darussalam); www.brazil.org.uk/page.php?cid=1189 (29/11/02) (Brazil); www.cnta.com/lyen/2fact/annual.htm (13/12/02) (China); www.embassy.org/cambodia/tourism/tour.htm (13/12/02)(Cambodia); www.stat.gov.tw (Taiwan); www.bps.go.id/sector/tourism/table25.shtml (29/11/02) (Indonesia); Barbados - Digest of Tourism Statistics. Barbados Statistical Service; Botswana - Contact - Mrs Joyce Morontshe. 353024 – phone 308675 – fax. tourism@botsnet.bw. Tourism/Tourism Officer II. Department of Tourism; Cook Islands - Annual Statistical Bulletin, June 2000. Cook Islands Statistics Office; Costa Rica - Estadisticas. Estadísticas, Instituto Costarricense del Turismo

(ICT), 2002; Federated States of Micronesia - FSM Department of Economic Affairs (FSMDEA) Data Collection. Contact - Edgar Santos (691 3202646/ 691 3205854/ Fsmrd@mail.fm) DEA/ Tourism Development Officer; Fiji - A) Fiji Visitors Bureau (FVB) Market Overview 1994, 1995, 1996 B) FVB Statistical Report on visitor Arrivals into Fiji 1994-1998. Aswal, c/- Alasdairs McIntyre, PO Box 38-201, Auckland, NZ; Greece - Greek National Tourisms Office Statistics. Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Vuti, L. Survey Report No. 15. Kiribati Visitor Survey. Commerce Department; Marshall Islands - Arrival cards & internal information (Office of Planning and Statistics (OPS): 1994 – 1998, Marshall Islands Visitors Authority(MIVA): 1999); Nepal - Nepal Tourist statistics, 1999. Ministry of Culture, Tourism and Civil Aviation; New Zealand - International Visitor arrivals – Published monthly by Statistics New Zealand. Contact - Anthony Sturrock email anthonys@nztb.govt.nz. Marketing research division, tourism New Zealand, New Zealand; Niue - Niue Statistics. Contact - Esther Pavihi (683 4224/ 4225/ esther.niuetourism@mail.gov.nu) Niue Tourism Office; Palau - Internal data from Palau Visitors Authority. Office of Planning & Statistics(OPS) Contact - Bernard Pullon (680 4885627/ brpullon@palaunet.com); Papua New Guinea - National Statistics Office (NSO) Contact - Catherine Aisoli (675 3011226/ 3251869/ caisoli@nso.gov.pg); Philippines - National Statistical Coordination Board, Philippine Statistical Yearbook. Department of Tourism; Samoa - A) Tourism Economic Impact Study. Vaai, A. K (Kolone Vaai & Associates); Tuinabua, L (TCSP); Ngau-Chuu, T (TCSP); and Riddout, P (Project Manager). B) Vuti, L. and Muagututia, R./ Petelo Kavesi.1994. Samoa Visitor Survey/ Annual Update. 1994; Singapore - Singapore tourist board (STB) Contact - Cindy Tay, 68313590 / Fax 67349217 E-Mail cindytay@stb.iom.sg ; Tonga - Tonga Visitors Bureau (TVB) Contact - Falati Papani (676 25334/ 23507); Trinidad & Tobago - Karen Ragoonanan; Tuvalu - Tuvalu Tourism Statistics Records. Tourism, Trade & Commerce (TTC). Contact - Mr Uatimani Maaloo. Tourism Officer; Vanuatu - National Tourism Development Office of Vanuatu (NTDO). Contact - Peris Kalopong (678 22515 or 22685 or 22813/ 23889/ tourism@vanuatu.com.vu). NTDO/ General Manager.

Methodology Average annual number of international tourists per km2 land over the past 5 years

Average annual number of international tourist-days per km2 of land over the last five years.

1. Although data on number of international tourists is generally available through WTO and in-country tourist boards (for 169 countries), the number of days stayed is generally not available (only 32 countries).

2. A proxy for this indicator using only the mean annual number of tourists / land area was used.

Rationale This is a measure for the additional load of all human impacts associated with international visitors and not reported in human population statistics. Tourists place additional pressure on the environment through increasing demands on local resources and through creation of pollution as well as physical disturbances of the environment. It is possible that their environmental burden is greater than that of residents

Indicator	TOUREVI	**Collection**	EVI 2004
Indicator #	247	**Sub-Index**	
Indicator Name	Tourists (scaled)		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	1996-2000		
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		

Methodology Using the variable TOURISTS, the authors applied the following break off values (where X =

mean number of international tourists x number of days stayed divided by area of land (sq km)):

EVI Score = 1 X < 3
EVI Score = 2 3 < X ≤ 3.5
EVI Score = 3 3.5 < X ≤ 4
EVI Score = 4 4 < X ≤ 4.5
EVI Score = 5 4.5 < X ≤ 5
EVI Score = 6 5 < X ≤ 5.5

Rationale This is a measure for the additional load of all human impacts associated with international visitors and not reported in human population statistics. Tourists place additional pressure on the environment through increasing demands on local resources and through creation of pollution as well as physical disturbances of the environment. It is possible that their environmental burden is greater than that of residents

Indicator CSTPOP **Collection** EVI 2004

Indicator # 248 **Sub-Index**

Indicator Name Human Populations

Units Population living with 100 km of a coast divided by the area of coastal lands (sq km).

Reference Year 2000-2001

Source WRI 2000-2001
CIA Fact sheets 2001

Additional source:

www.nso.go.th/pop2000/table/tab1.pdf (Thailand); UNDP, UNEP, World Bank, WRI. 2000 World Resources 2000-2001: People and Ecosystems: The fraying web of life. World Resource Institute. Washington, D.C.; Cook Islands - 1996 Census of Population & Dwelling. Cook Islands Statistics Office; Costa Rica - Instituto nacional de Estadisticas y Censo, 2000; Federated States of Micronesia - FSM 1999 Statistical Yearbook.
Fiji - A) 1996 Population & Housing Census. Bureau of Statistics. B) CIA World Fact book 1999; Greece - Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Report on the 1995 Census of Population, Volume 1: Basic Information & Tables; Nauru - Nauru Census, 1992. Bureau of Statistics; Niue - Niue Household Listing Report, 9 – 10 October 1999; Palau - Census of Population & Housing, 2000. Office of Planning and Statistics (OPS); Papua New Guinea - Report on 1990 National Population and Housing Census in PNG. National Statistics Office; Republic of Marshall Islands - Republic of Marshall Islands (RMI) Statistical Abstract. Contact - Jefferson Butuna's contact: 3802/ 3805/ planning@ntamar.com. Office of Planning & Statistics; Samoa - Population Census 1991 (pp 16). Statistics Department; Tonga - Population Census 1996: 1) Administrative and General Tables. Statistics Department; Tuvalu - A) Census Report, 1991. B) Cartastro Survey Project, 1991.

Methodology Density of people living in coastal settlements (i.e. with a city centre within 100km of any maritime or lake* coast). (* To be included, lakes must have an area of at least 100 sq km).

1. Area of coastal lands is calculated by multiplying length of all coastlines (maritime + lake) by 100km. Where this figure exceeds the total area of land in a country (from WRI 2000-2001 and CIA 2002, Indicator 11), the figure used is total land area. This situation can occur because of overlap of the 100km band where coasts are close together or very convoluted.

2. Landlocked countries for which this indicator is not applicable are given the value of zero (and the lowest EVI score).

Rationale This indicator captures the focus of stress on coastal ecosystems, often the most productive living areas in a country, through pollution, eutrophication, resource depletion and habitat degradation. The adjacent water areas are capable of spreading pollution widely in aquatic habitats and will not tend to allow for attenuation over upland areas. Countries with heavy densities of human populations living on their coastal areas are likely to be damaging some of their most productive and diverse areas and negatively affecting the resilience of the country to natural disasters such as cyclones, tsunamis etc.

Indicator CSTPOPEVI **Collection** EVI 2004

Indicator # 249 **Sub-Index**

Indicator Name Human Populations (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 2000-2001

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable COASTAL, the authors applied the following break off values (where X = population living with 100 km of a coast divided by the area of coastal lands (sq km)):

EVI Score = 1 $X < 3$
EVI Score = 2 $3 < X \leq 3.5$
EVI Score = 3 $3.5 < X \leq 4$
EVI Score = 4 $4 < X \leq 4.5$
EVI Score = 5 $4.5 < X \leq 5$
EVI Score = 6 $5 < X \leq 5.5$
EVI Score = 7 $X > 5.5$

Rationale This indicator captures the focus of stress on coastal ecosystems, often the most productive living areas in a country, through pollution, eutrophication, resource depletion and habitat degradation. The adjacent water areas are capable of spreading pollution widely in aquatic habitats and will not tend to allow for attenuation over upland areas. Countries with heavy densities of human populations living on their coastal areas are likely to be damaging some of their most productive and diverse areas and negatively affecting the resilience of the country to natural disasters such as cyclones, tsunamis etc.

Indicator AGRMT **Collection** EVI 2004

Indicator # 250 **Sub-Index**

Indicator Name Environmental Agreements

Units Number of treaties in force.

Reference Year 2003

Source SEDAC / CIESIN database 2003: http://sedac.ciesin.columbia edu.

Additional sources:

www.sedac.ciesin.org/prod/charlotte source from IUCN; Cook Islands - Cook Islands Environment Bill 2000. Environment Services; Costa Rica - La Asamblea Legislativa De La Republica De Costa Rica. Publicación y rige: 13/11/95; Federated States of Micronesia - FSM Review of Environmental Law. Harding, E. 1992. FSM Department of Economic Affairs; Fiji - Fiji's Draft Sustainable Development Bill. 1996. Department of Environment (DoE); Greece -

Contact - Dr Paula Scott (ph&f: 30 81 8 61 219, cariad@her.forthnet.gr); Kiribati - Environment Act 1999. Government of Kiribati. Environment & Conservation Division; Kyrgyzstan - Contact - Mr. Myrsaliev N(Unit of Conventions). Department of State Ecological Control and Environment Utilization; Marshall Islands - Crawford. M,1992. RMI National Environmental Strategy Report (NEMS) Report. Republic of Marshall Islands Environmental Protection Agency; Nauru - Thaman, R R and Hassall, P C. 1999 Nauru National Environmental Strategy Report (NEMS); Nepal - Contact - Mr Damodar Adhikari, Phone/Fax ++(1) 499700, E-Mail: dadhikar@Wlink.com.np President - Society For Environment and development, Kathmandu; New Zealand - Official series of New Zealand legislation: Environment act 1986, Conservation act 1987, Resource management act 1991, Fisheries act 1983 & 1996, Crown materials act 1991, Hazardous substances and new organisms act 1996, Ozone layer protection act, energy efficiency and conservation act 2000. Ministry of the Environment; Niue - Source - Environment Office. Contact - Tagaloa Cooper. Community Affairs; Palau - Contact - Robert (Bob) Marek (680 4881639 or 3600/ 4882963/ eqpb@palaunet.com) Environmental Quality Protection Board; Papua New Guinea - Contact - Katrina Solien. (EPA)/ Assistant Manager Office of Environment & Conservation. (OE & C); Philippines - Contact - Mr.Percival A. Guiuan / (632) 8965390 / pa.guiuan@nscb.gov.ph Statistical Coordination Officer. Department of Environment and Natural Resources (DENR); Singapore - Source - Ministry of the Environment, International relations Department. Contact - Jucin Chan 6567319087 Fax - 6567384468 E-Mail jacin_chan@env.gov.sg. International relations department / senior international relations executive; St Lucia - Contact - Christopher Corbin Tel: 7584685041 Fax - 7854516958 E-Mail ccorbin@planning.gove.lc. Sustainable development and environment department; Thailand - Pollution Control Department. Tel 66 2 2982253 Fax 66 2 2982240 e-mail: marinepollution_pcd@yahoo.com; Tonga - Environmental Management Plan for the Kingdom of Tonga. UN - ESCAP. EPACS; Trinidad &Tobago - Contact - John Agard; Tuvalu - Contact - Mataio. Environment Department.

Methodology

Number of environmental treaties in force in a country.

1. Information for using the original form of this indicator, were generally not available, though most of our collaborators did provide valuable information for this indicator. As a result, we used public information on number of treaties in force, which is available for a large number of countries.

2. The logic of using treaties is that international environmental treaties provide guidance and support for environmental policy and implementation. Countries that are signatories to a significant number of treaties are likely to have at least considered some of their more important issues, be undertaking some monitoring and control, have access to guidance, and be under pressure to correct problems.

3. Being signatory to a treaty does not guarantee that the environment is managed or that obligations under the treaty are being met.

Rationale

This indicator captures the level of management and stewardship of the environment in a country. Two aspects of legislation are needed: the message to the public that environmental management is essential, and the effectiveness of controls. The benefits of good management would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator	AGRMTEVI	**Collection**	EVI 2004
Indicator #	251	**Sub-Index**	
Indicator Name	Environmental Agreements (scaled)		
Units	Standardized unit scale (from 1-7; with 1 as good and 7 as bad)		
Reference Year	2003		

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable AGREEMENTS, the authors applied the following break off values (where X = number of treaties in force):

EVI Score = 1 $60 < X$
EVI Score = 2 $50 < X \leq 60$
EVI Score = 3 $40 < X \leq 50$
EVI Score = 4 $30 < X \leq 40$
EVI Score = 5 $20 < X \leq 30$
EVI Score = 6 $10 < X \leq 20$
EVI Score = 7 $X \leq 10$

Rationale This indicator captures the level of management and stewardship of the environment in a country. Two aspects of legislation are needed: the message to the public that environmental management is essential, and the effectiveness of controls. The benefits of good management would be especially important if there are many endangered species, sensitive ecosystems, and interactions with on-going human impacts.

Indicator CONFLT **Collection** EVI 2004

Indicator # 252 **Sub-Index**

Indicator Name Human Conflicts

Units Number of conflict years

Reference Year 1991-2000

Source EM-DAT: The OFDA/CRED International Disaster Database, http//: www.cred.be/emdat - Université Catholique de Louvain - Brussels - Belgium

Additional sources:

www.cred.be/emdat Université Catholique de Louvain - Brussels – Belgium; Botswana - Office of the President. Contact - Mr Pitlagano Gabasiane350804 – Phone581028 - Faxpgabasiane@gov.bw - email. Principal Administration OfficerPolitical Affairs Division; Cook Islands - Contact - Antoine Nia (682 21256/ 682 22256) Environment Services; Costa Rica - San José, C.R[Ed]. 1998 Guerra civil en costa rica/Jhon Patrick bell -4a; Kyrgyzstan - Contact - Mr. Myrsaliev N(Unit of Conventions). Department of State Ecological Control and Environment Utilization; Marshall Islands - Contact - Ellia Sablan (8262 or 5632/ 5447 or 5130/ ellia_sablan@hotmail.com) Marshall Islands Marine Resources Authority; Nauru - Contact - Davey Roxen Pene Agadio (674 4443181/ 4443791) Department of Island Development & Industries (Dept. of IDI); New Zealand - Contact - Hine-Wai Loose. Ministry for the Environment; Niue - Contact - Sisilia Talagi (683 4200/ 4232/ secgov.Premier@mail.gov.nu) Premier's Department/ Secretary to Government; Samoa - Contact - Vainuupo Jungblut. Lands, Surveys & Environment; Singapore - A periodical history of Singapore/ National heritage board-Journey into nationhood, National heritage board-National dictionary of Singapore, Newspapers Official records. (National archives of Singapore); St Lucia - Mr Crispin D'Auvergne (cdauvergne@planning.gov.lc) Ministry of Justice; Thailand - Source: Department of Local Administration, Ministry of Interior. Contact - Mr. Prapun Sangwichit. Chief of Economics and Social Faculty, Administration Institute of Development; Trinidad & Tobago - Contact - Cindy Buchoon; Tuvalu - Environment Unit GOT and SPREP, 1995. Department of Lands and Survey; Vanuatu - Police Records. Vanuatu Police Force.

Methodology Average number of conflict years per decade over the past 50 years.

1. The EM-DAT database covers only the period 1991-2000. Data should be for a longer time

series.

2. There is no information on the type or geographic extent of conflicts, numbers of people involved, or duration. Incorporating these measures would improve the indicator's ability to measure likely ecological effects.

3. For future evaluations of the EVI values should be calculated as mean number of conflict years per decade and used against the same scale indicated here.

4. The number of conflict years can be greater than the number of data years if there are multiple simultaneous conflicts in the country.

5. Conflict: Use of armed force between the military forces of two or more governments, or of government and at least one organized armed group, resulting in the battle-related deaths of at least 10 people or 100 affected in one year. (SIPRI definition adapted to for EMDAT). In EM-DAT, conflict includes the disaster types 'intrastate conflict' and 'international conflict'.

6. Intrastate conflict: CRED has adopted the simple Project Ploughshares' typology of modern armed conflict based on three overlapping types of intrastate conflict: state control, state formation and state failure.

7. International conflict: This includes border disputes, foreign invasion and other cross-border attacks (Project Ploughshares).

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters related to human conflicts. Conflicts can result in habitat disturbance and degradation, pollution and a complete breakdown in environmental management. The direct effects include degradation through bombing, land mines, and chemicals left in the environment, temporary camps and vehicle disturbances, and damage caused by displaced people who need to support themselves under emergency conditions. This is also a proxy for the lack of environmental management during those years. The effects of civil unrest would be especially important if they were on-going, repeated, or occurring as separate events in more than one part of a country. Effects would be amplified if there are many endangered species, sensitive ecosystems, and interactions with other on-going human impacts. The time frame used reflects the long term nature of conflict-related damage to the environmental support system.

Indicator CONFLTEVI **Collection** EVI 2004

Indicator # 253 **Sub-Index**

Indicator Name Human Conflicts (scaled)

Units Standardized unit scale (from 1-7; with 1 as good and 7 as bad)

Reference Year 1991-2000

Source Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.

Methodology Using the variable CONFLICTS, the authors applied the following break off values (where X = number of conflict years):

EVI Score = 1 X = 0
EVI Score = 2 Not used
EVI Score = 3 Not used
EVI Score = 4 Not used
EVI Score = 5 $0 < X \leq 2$
EVI Score = 6 $2 < X \leq 5$
EVI Score = 7 $X > 5$

Rationale This indicator captures the risk to terrestrial, aquatic ecosystems and ground waters related to human conflicts. Conflicts can result in habitat disturbance and degradation, pollution and a complete breakdown in environmental management. The direct effects include degradation through bombing, land mines, and chemicals left in the environment, temporary camps and vehicle disturbances, and damage caused by displaced people who need to support themselves under emergency conditions. This is also a proxy for the lack of environmental management during those years. The effects of civil unrest would be especially important if they were on-going, repeated, or occurring as separate events in more than one part of a country. Effects would be amplified if there are many endangered species, sensitive ecosystems, and interactions with other on-going human impacts. The time frame used reflects the long term nature of conflict-related damage to the environmental support system.

Collection 4: Rio to Johannesburg Dashboard

Indicator PLBOD **Collection** Rio to Johannesburg Dashboard

Indicator # 254 **Sub-Index**

Indicator Name Percent Population Living Below One Dollar Per Day

Units Percent of population

Reference Year 1996

Source World Bank SIMA and World Development Indicators online

Poverty Calculator: http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp

Deininger and Squire

Methodology The CSD Methodology Sheet states, "The most important purpose of a poverty measure is to enable poverty comparisons" and notes key branches of such comparisons. The RIOJO dashboard follows the branch monitoring absolute poverty with the World Bank's preferred measure, percent of population living on less than $1 a day in 1985 international or purchasing power parity (PPP) prices.

Since PPP rates were designed for comparing national accounts aggregates, not for international poverty comparisons; there is no certainty that this international poverty line measures the same degree of need or deprivation across countries, within different regions of one country, or across socio-economic groups all of which are important branches of poverty comparisons. To some extent all other indicators in the CSD Thematic Framework contribute to the other main branch, relative poverty comparisons, in addition to monitoring specific aspects of sustainable development.

The choice between income and consumption as welfare indicators is discussed in the CSD Methodology Sheet. Income is generally more difficult to measure; consumption accords better with the idea of the standard of living than does income, which can vary over time even if the standard of living does not. However, consumption data are not always available and when they are not there is little choice but to use income. Moreover, household survey questionnaires can differ widely, for example in the number of distinct categories of consumer goods they identify; survey quality varies and even similar surveys may not be strictly comparable. Since the World Bank is the only source for this indicator, coverage in the RIOJO Dashboard reflects judgments by that institution's experts about use of income-based estimates.

Placeholders for OECD nations presume minimal (0%) rate.

Indicator	GINI	**Collection**	Rio to Johannesburg Dashboard
Indicator #	255	**Sub-Index**	
Indicator Name	Gini Index		
Units	Gini coefficient of inequality (higher numbers signify greater inequality)		
Reference Year	1998		
Source	UNU/UNDP WIDER - World Income Inequality Database, http://www.wider.unu.edu/wiid/wiid.htm World Bank Deininger and Squire.		
Methodology	This measure of income or resource inequality, together with the indicator of per capita income, gives a sense of relative poverty. To promote consistency with the absolute measure, consumption-based estimates were preferred where income-based estimates were also available; cell-level comments flag use of the latter when the former are not available. The sources consulted catalog major factors in assessing data quality, assign an overall score to each "point" estimate, and discard those compilers rate below their minimum standard for such estimates. Since the RIOJO Dashboard offers range estimates (with parallel measures of data quality in its underlying database), it includes most estimates underlying sources rejected as point estimates. In a few cases urban and rural estimates reported separately in noted sources have been combined using appropriate population weights.		

Indicator	FWAGEGAP	**Collection**	Rio to Johannesburg Dashboard
Indicator #	256	**Sub-Index**	
Indicator Name	Female Wage Gap		
Units	Female wages in manufacturing as % of males		
Reference Year	2000		
Source	International Labour Organization LABORSTA UN CDB US Bureau of Labor Statistics (for US data, 2000)		
Methodology	The CSD Methodology Sheet observes that "[T]he lower the ratio of wages offered to women, the less the attraction for women to join the labor force, which in turn deprives the economy of a vital component of development." Data are mainly from the UN's Common Data Base, which in turn draws on data from the International Labour Organization (ILO). Where possible, data refer to wages in manufacturing to minimize problems of international comparability. ILO sources are national labour force surveys, labour-related establishment surveys, collective agreements, industrial/commercial surveys, insurance records, industrial/commercial censuses, labour-related establishment censuses, or administrative reports. Reports may refer to earnings, wages, wage rates, or salaries; per hour, week, or month. Data may cover all employees, wage earners, or salaried employees. Finally, data may be based on Revision 3 or 2 of the International Standard Industrial Classification.		

Indicator	CHLDMRT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	257	**Sub-Index**	
Indicator Name	Under-Five Mortality Rate		
Units	Deaths per 1,000 live births		
Reference Year	2000		
Source	World Health Organization World Bank SIMA and WDI online		
Methodology	Under-5 mortality rate is the probability that a newborn baby will die before reaching age five. Since the construct is derived from demographic models; time period coverage depends on periodicity of modeling exercises. WHO has stated it will now update this indicator annually, with uncertainty intervals. The World Bank projects model results quinquennially to 2050.		

Indicator	LIFEEXP	**Collection**	Rio to Johannesburg Dashboard
Indicator #	258	**Sub-Index**	
Indicator Name	Life Expectancy at Birth		
Units	Years		
Reference Year	2000		
Source	World Health Organization World Bank SIMA and WDI online US Bureau of Census IDB		
Methodology	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Since the construct is derived from demographic models; time period coverage depends on periodicity of modeling exercises. The World Bank and us Bureau of Census project model results at least quinquennially to 2050. WHO has introduced a refinement (healthy life expectancy or HALE) that deducts years of ill-health, weighted by severity, from the expected overall life expectancy. WHO has stated it will update both life expectancy and HALE annually, with uncertainty intervals.		

Indicator	CHLDIMM	**Collection**	Rio to Johannesburg Dashboard
Indicator #	259	**Sub-Index**	
Indicator Name	Child Immunization (DPT only)		
Units	Percent of children under 12 months		
Reference Year	1999		
Source	United Nations Children's Fund (Unicef), Progress since the World Summit for Children: A Statistical Review		

World Bank SIMA and WDI online

Methodology Immunization rates are available individually for several diseases likely to occur during childhood without immunization. However, no synthetic indicator gauges full immunization. The World Health Organization's WHO vaccine preventable diseases: monitoring system: 2000 global summary reports time series on immunization coverage for: BCG (Bacille Calmette Guérin) vaccine, DTP3 (third dose of diphtheria toxoid, tetanus toxoid, and pertussis vaccine), HepB3 (third dose of hepatitus B vaccine); MCV (measles-containing vaccine), POL3 (third dose of polio vaccine), and TT2plus (second and subsequent doses of tetanus toxoid); YFV (Yellow fever vaccine). The present exercise only considers coverage for DPT and relies primarily on WHO and defaults to World Bank DPT reports

Indicator	CPR	**Collection**	Rio to Johannesburg Dashboard
Indicator #	260	**Sub-Index**	
Indicator Name	Contracepitve Prevalence Rate		
Units	Percent of women aged 15-49		
Reference Year	late 1990s		
Source	World Bank SIMA and WDI online		

Methodology Contraceptive prevalence rate is the percentage of women who are practicing, or whose sexual partners are practicing, any form of contraception. It is usually measured for married women age 15-49 only.

Indicator	PERGR	**Collection**	Rio to Johannesburg Dashboard
Indicator #	261	**Sub-Index**	
Indicator Name	Persistence to Grade 5, Total		
Units	Percent of cohort		
Reference Year	1997		
Source	UN Economic and Social Council (Unesco) obtained via WB SIMA		

Methodology Persistence to grade 5 (percentage of cohort reaching grade 5) is the share of children enrolled in primary school who eventually reach grade 5. The estimate is based on the reconstructed cohort method.

OECD countries might look worse than they are, see for example the Netherlands and latest UNESCO statistics.

Indicator	SECENR	**Collection**	Rio to Johannesburg Dashboard
Indicator #	262	**Sub-Index**	
Indicator Name	Secondary School Gross Enrollment Ratio		
Units	Secondary school pupils as percent of secondary school aged population		
Reference Year	1998-2002 (most recent year available)		
Source	USAID Global Education Database (GED) at http://qesdb.cdie.org/ged/index.html		

UNESCO Institute for Statistics

Methodology Enrollment of secondary students of all ages expressed as a percentage of the secondary school-age population. The ratio describes the capacity of a school system in relation to the size of the official school-age population. For example, a ratio of 100 percent indicates that the number of children actually enrolled, including those outside the official age range, is equivalent to the size of the official secondary school-age population. It does not mean that all children of official secondary school-age are actually enrolled. If the ratio were so misinterpreted, it would overstate the actual enrollment picture in those countries in which a sizable proportion of students are younger or older than the official age owing to early or delayed entry or to repetition.

Indicator LITRT **Collection** Rio to Johannesburg Dashboard

Indicator # 263 **Sub-Index**

Indicator Name Adult Literacy Rate

Units Percent of adult population (25 and over)

Reference Year late 1990s

Source Unesco as given by USAID Global Education Database (GED) and World Bank SIMA

Methodology The population aged 15 years and above who can both read and write with understanding a short simple statement on their every day life. It has been observed that some countries apply definitions and criteria of literate (illiterate) which are different from the international standards or equate persons with no schooling as illiterates. Practices for identifying literates and illiterates during actual census enumeration may also vary, as well as errors in literacy self-declaration can also affect the reliability of literacy statistics.

Indicator FLRAREA **Collection** Rio to Johannesburg Dashboard

Indicator # 264 **Sub-Index**

Indicator Name Floor Area Per Person in Selected Cities

Units Square meters per person

Reference Year 1993

Source UN-Habitat database and WRI World Resources 1998-1999

Methodology The CSD Methodology Sheet states
Alternative measures of crowding have been the subject of data collection and reporting in international statistical compendia. The two most common are persons per room and households per dwelling unit, each of which was included among data collected during the first phase of the Housing Indicators Programme (UNCHS, World Bank, 1992). Surveys have shown that floor area per person is more precise and policy sensitive than the other two indicators.
This indicator is in the 1993 UN-Habitat database of Global Urban indicators but not the 1998 update; neither alternative is included in either database. Hence, The RioJo Dashboard reports available 1993 estimates as 1990 and carries them forward to 2000.

Indicator	HOMICD	**Collection**	Rio to Johannesburg Dashboard
Indicator #	265	**Sub-Index**	
Indicator Name	Homicides		
Units	Per 100,000 of population		
Reference Year	Benchmarks only		
Source	WHO age-standardized death rates International Crime Victim Survey, http://ruljis.leidenuniv.nl/group/jfcr/www/icvs/Index.htm UNDP, UN-Habitat Global Urban Indicators, http://www.unhabitat.org/guo/gui/index.html		
Methodology	The CSD Methodology Sheet discusses Number of Reported Crimes but warns Definitions of what is or is not a crime may vary for different countries. So may readiness to report to the police, readiness to record by the police, methods of counting, accuracy and reliability of the recorded figures reported. The CGSDI initially complied the specified indicator but these problems clearly left results more noise than signal. For example, by this indicator Scandinavian nations are the most crime-ridden. As a less noisy measure the RioJo Dashboard reports homicides. It gives preference to WHO estimates of death by homicide as the most standardized measure available and fills gaps from sources noted below in descending preference order. No attempt has been made to harmonize these data sources, some of which report national estimates while others refer to one or a few cities.		

Indicator	URBANPCT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	266	**Sub-Index**	
Indicator Name	Urbanization		
Units	Percentage of total population		
Reference Year	2000		
Source	World Bank SIMA and WDI online		
Methodology	The CSD Thematic Framework envisages an indicator of Population of Urban Formal and Informal Settlements here plus one on Area of Urban Formal and Informal Settlements under Environment; it describes each as "focusing on the legality of human settlements [to measure] the marginality of human living conditions." Since UN-Habitat gives some city estimates of population but not land area by tenure types, in practice only one such indicator is likely for the foreseeable future. On the other hand, the Framework does not seek an indicator of urbanization. The RioJo Dashboard therefore reports the share of urban in total population here and the available indicator of urban "marginality" under Environment.		

Indicator	CLMCHG	**Collection**	Rio to Johannesburg Dashboard
Indicator #	267	**Sub-Index**	
Indicator Name	Climate Change (Carbon Emissions Per Capita)		
Units	Metric Tons of Carbon Equivalent per Person		
Reference Year	1999		

Source US Department of Energy International Energy Administration

Methodology The CSD Methodology Sheet calls for a broad composite measure, of Anthropogenic emissions, less removal by sinks, of the greenhouse gases carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6), chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), together with the indirect greenhouse gases nitrogen oxides (NOx), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs).

Such a measure is available only for Parties to the UN Framework Convention on Climate Change but estimates of CO2 emissions are available for most countries. Hence, the RioJo Dashboard reports separately on CO2 emissions.

Greenhouse gases, CO2 emissions from burning fuel
Carbon dioxide (CO2) is the most prevalent of several gases associated with global warming; burning (consumption and flaring) of fossil fuels is the main anthropogenic (human) source of CO2 emissions. More comprehensive estimates of greenhouse gases (GHG) submitted to the International Protocol on Climate Change (IPCC) by 37 industrialized nations suggest that CO2 emissions from burning fuel account for three-quarters of GHG emissions excluding land-use change and forestry, areas in which removals of CO2 (carbon-banking in biomass) often outweigh emissions.

Indicator OTHRGHG **Collection** Rio to Johannesburg Dashboard

Indicator # 268 **Sub-Index**

Indicator Name Other Greenhouse Gases

Units Metric tons per capita

Reference Year 1998

Source UN Framework Convention on Climate Change

Methodology Covers, for the 37 Parties to the UN Framework Convention on Climate Change, aggregate emissions of CO2 other than from burning fuel (see above), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF), including CO2 emissions/removals from land-use change and forestry. Data in gigagrams of CO2 equivalent were divided by population *1000 to measure metric tons per capita. However, methodological differences between this source and US DOE reports on CO2 mean the two measures of GHG emissions are not additive.

Indicator CROPLAND **Collection** Rio to Johannesburg Dashboard

Indicator # 269 **Sub-Index**

Indicator Name Arable and Permanent Cropland

Units Percentage of total land area

Reference Year 2000

Source FAOSTAT

Methodology Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is not included.

Indicator	FERTCON	**Collection**	Rio to Johannesburg Dashboard
Indicator #	270	**Sub-Index**	
Indicator Name	Fertilizer Consumption		
Units	100 grams per hectare of harvested land		
Reference Year	1999		
Source	FAOSTAT with CGSDI synthesis of data on harvested area		

Methodology

The CSD Methodology Sheet observes
Environmental impacts caused by leaching and volatilization of fertilizer nutrients depend not only on the quantity applied, but also on the condition of the agro-ecosystem, cropping patterns, and on farm management practices. In addition, this indicator does not include organic fertilizer from manure and crop residues, or the application of fertilizers to grasslands. The indicator assumes even distribution of fertilizer on the land… A more relevant and sophisticated indicator would focus on nutrient balance to reflect both inputs and outputs associated with all agricultural practices. This would address the critical issue of surplus or deficiency of nutrients in the soil. This would need to be based on agro-ecological zones.

Such refinements require geographic information systems (GIS) that are very useful for subnational analyses yet rarely yield national indicators, the goal of the present exercise. While full discussion of "scale" problems is beyond this paper, what is relevant here is that distinct attributes, say of land, come into focus as scale (time and place) changes. Harmonizing information for decision-making on "nested" scales requires that indicators on each level consider attributes analyzed at others. As an example, without major changes in data collections, fertilizer consumption is here related to harvested rather than arable land as specified in the CSD Methodology Sheet.

A case can be made for this change independent of scale problems. In addition to harvested area, arable land covers fallow and grasslands for fodder, neither of which is usually fertilized. Harvested land is a denominator more relevant to the numerator. Aggregating harvested land is complicated by multi-cropping, which was only crudely introduced to the present exercise (arable land set the upper limit for estimates based on crop-level data on area harvested). But issues like greater need for fertilizer with multi-cropping (and for fallow land when fertilizer use is low) and the influence of crop choice on fertilizer demand (high for rice, low for potatoes, etc.) are at the heart of decision-making about sustainable fertilizer consumption. Such decisions require subnational analysis but defining national indicators like intensity of fertilizer use with an eye on multi-level decision-making increases their effectiveness.

Indicator	PESTUSE	**Collection**	Rio to Johannesburg Dashboard
Indicator #	271	**Sub-Index**	
Indicator Name	Use of Pesticides		
Units	Kilogram per ha of cropland		
Reference Year	Benchmark		
Source	WRI Table AF.2 Agricultural Land and Inputs; Environmental Sustainability Index (ESI) via CIESIN		

Methodology

The CSD Methodology Sheet notes pesticide supply-use data in metric tons are only available from international sources for selected countries and limited to the major types of pesticide. Some pesticide data are available for about 50-60 countries. The data are not regularly collected and reported, and not usually available on a sub-national basis. Hence, while compilation is analogous to fertilizer consumption in principle, in practice it requires

considerably more "tweezers" work. The RioJo Dashboard therefore did not attempt to go beyond spotty estimates of WRI and ESI.

Indicator	FORESTAR	**Collection**	Rio to Johannesburg Dashboard
Indicator #	272	**Sub-Index**	
Indicator Name	Forest Area		
Units	Percent of country's territory (based on reports in thousands of hectares)		
Reference Year	2000		
Source	FAO State of the World's Forests 2001		
Methodology	The CSD Methodology Sheet observes, "Due to the definition used, the indicator covers a very diversified range of forests ranging from open tree savanna to very dense tropical forests." Yet it excludes areas of shrubs/trees and forest fallow that are over half of wooded areas in 40 and over a third for another 30 countries. Refinements in definition and measurement tools (e.g., better satellite images) have created breaks in time series on forest area that are often large relative to actual changes in forest area. Since the latest FAO Forest Resources Assessment (FRA) reports forest area for 1990 and 2000 it suffices for the RioJo Dashboard. However, FRA is a "rolling" comparison of a recent date with one a decade or quinquennium earlier; considerable work will be required to indicate whether deforestation is slowing over		

Indicator	POPCOAST	**Collection**	Rio to Johannesburg Dashboard
Indicator #	273	**Sub-Index**	
Indicator Name	Population in Coastal Zones		
Units	Percentage of the total population within 100 km of the coast		
Reference Year	2000		
Source	World Resources Report 2000-01, World Resources Institute		
Methodology	Percent of population living within 100 kilometers of a coast. Note: CIESIN's PLACE data set provides a more accurate estimates of the percentage of the population living within various distances of the coast. See http://sedac.ciesin.columbia.edu/place/		

Indicator	RENWAT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	274	**Sub-Index**	
Indicator Name	Use of Renewable Water Resources		
Units	Consumption as a percent of potentially utilizable water resources		
Reference Year	2000		
Source	International Water Management Institute, Water for Rural Development (2001), World Water Demand and Supply (1998), and World water supply and demand (2000) World Resources Institute		
Methodology	The CSD Methodology Sheet seeks the "total annual volume of ground and surface water		

abstracted for water uses as a percentage of the total annually renewable volume of freshwater." The denominator (renewable volume) is from hydrological models while the numerator (use) is from household surveys, censuses, etc. Unless a "water balance" model harmonizes the two, the ratio is often misleading. Such modeling is in its infancy and key parameters (e.g., national average use of water in irrigation) need further expert review. Indeed, International Water Management Institute PODIUM studies, which provide most data for this RioJo indicator, began to foster such review. However, early IWMI studies (see sources) "show to what extent freshwater resources are already used, and the need for adjusted supply and demand management policy," the indicator goal in the CSD Methodology Sheet.

While WRI reports the specified denominator IWMI suggests a refinement, potentially utilizable water resources (PUWR), to exclude rainfall that cannot be stored with “technically, socially, environmentally, and economically feasible water development programs.” Ideally, both would be monitored over time to show natural changes in renewable volume (e.g., variable rainfall) and human-induced shifts in PUWR (as technology and price structures vary). In practice one must choose between two benchmarks. The RioJo Dashboard favors the refinement since IWMI shows it helps distinguish between physical and economic water scarcity, a key issue in management policy choices.

IWMI also refines WRI benchmarks on water use by sector to calibrate scenarios for policy responses to rising demand over time. IWMI first gave 1990 as its benchmark date but moved to 1995, always projecting results to 2025. The initial study gave country projections in two scenarios, business-as-usual or more efficient use of water for irrigation; further studies only the latter. First results were used for the RioJo Dashboard given its focus on 1990 and 2000, projecting 1990 to 2000 by business-as-usual growth. For countries only in recent studies (from the former USSR), 1995 estimates of water use were projected to 2000 and back to 1990 with their assumption of more efficient irrigation.

Indicator	BODEMIS	**Collection**	Rio to Johannesburg Dashboard
Indicator #	275	**Sub-Index**	
Indicator Name	Water, organic pollutant (BOD) emissions		
Units	kg per day per worker		
Reference Year	1998		
Source	World Bank SIMA and WDI online		
Methodology	The CSD Methodology Sheet envisages use of GEMS/Water data but these are currently too limited to use except as a last resort (the case, for example, with faecal coliform). In this case the World Bank provides an alternative by modeling emissions per worker, or total emissions of organic water pollutants divided by the number of industrial workers. Organic water pollutants are measured by biochemical oxygen demand, which refers to the amount of oxygen that bacteria in water will consume in breaking down waste. This is a standard water-treatment test for the presence of organic pollutants.		

Indicator	INVEST	**Collection**	Rio to Johannesburg Dashboard
Indicator #	276	**Sub-Index**	
Indicator Name	Investment		
Units	percentage of GDP		
Reference Year	2000		
Source	World Bank SIMA and WDI online		

Methodology Where possible data refer to gross domestic investment, i.e., the sum of gross fixed capital formation and changes in inventories. For a number of countries, however, estimates of the latter are not available or relate only to changes in livestock and most changes in inventories are subsumed in residual estimates of private consumption.

Indicator CURACCT **Collection** Rio to Johannesburg Dashboard

Indicator # 277 **Sub-Index**

Indicator Name Current Account Balance

Units Percentage of GDP

Reference Year 2000

Source IMF Balance of payments statistics and World Bank SIMA and WDI online

Methodology The CSD Methodology Sheet states, "The balance of trade in goods and services is defined in the 1993 SNA, and partly in the International Trade Statistics." In fact there are three types of data sources (foreign trade, balance of payments, and national accounts) that are reconciled conceptually but often yield quite different country measures. The slightly broader indicator from the balance of payments, current account balance (CAB) has been taken for the RioJo Dashboard for practical reasons, with gap filling from the other sources.

CAB covers current transfers as well as net exports of goods, services, and income. In theory the sum of CABs for all countries (plus supranational organizations) is zero; in practice it can be large and highly variable. The size of such unrecorded "net errors and omissions" suggests the margin of error in country-level CABs.

Indicator EXTDEBT **Collection** Rio to Johannesburg Dashboard

Indicator # 278 **Sub-Index**

Indicator Name External debt

Units Percentage of GDP

Reference Year 2000

Source World Bank SIMA and WDI online

International Monitary Fund (IMF)

Methodology The CSD Methodology Sheet states
The principal sources of the information for the long-term external debt indicator are reports from member countries to the World Bank through the Debtor Reporting System (DRS). These countries have received either IBRD loans or IDA credits. A total of 137 individual countries report to the World Bank's DRS.
The RioJo Dashboard uses DRS data where available and relies on other sources for countries that are not IBRD/IDA borrowers. Where possible such additions are based on official reports of a nation's international investment position, preferably as reported in IMF Balance of Payments Statistics (BOPS). Failing that, government external debt data from the IMF's International Financial Statistics have been used (with conversion to US dollars).

Exceptionally, US data are as reported in Federal Reserve Board's Flow of Funds report on rest of world holdings of US Government Securities. Since the US dollar is the world's main reserve currency, the portion of such securities held abroad might change without any specific intention on the part of the US Government to borrow from or repay nonresidents. To

a lesser extent, the same can be said of other reserve currency countries (in Europe and Japan).

Indicator	AIDEXCH	**Collection**	Rio to Johannesburg Dashboard
Indicator #	279	**Sub-Index**	
Indicator Name	Aid Given or received (% GNP)		
Units	Percentage of GDP		
Reference Year	2000		
Source	World Bank Data Query for recipients, OECD reports for donors		
Methodology	Official development assistance and net official aid record the actual international transfer by the donor of financial resources or of goods or services valued at the cost to the donor, less any repayments of loan principal during the same period. Aid dependency ratios are computed using values in U.S. dollars converted at official exchange rates.		

Indicator	DIRMAT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	280	**Sub-Index**	
Indicator Name	Direct material input		
Units	Percentage of GDP		
Reference Year	1999		
Source	World Bank Genuine Saving, UNCTAD World exports and imports of minerals and metals		
Methodology	The CSD Methodology Sheet limits Intensity of material use to national consumption of metals and minerals in metric tons (divided by GDP). UNCTAD is lead agency for this indicator but its website does not offer data specified nor estimates of national consumption of some 20 commodities per unit of GDP mentioned in the Sheet. WRI and the Wuppertal Institute offer a suite of material use indicators with a metals and minerals subset but only for some OECD countries. The placeholder in the RioJo Dashboard refers to what they call direct material input (DMI), limited to key metals and minerals but calculable for most countries with defined, actionable imperfections discussed here. DMI measures supply (domestic extractions + imports) = demand (national consumption + exports + net addition to stocks or NAS). DMI is easier to measure than consumption because data on NAS are sparse. International comparison of DMI entails double-counting trade in metals and minerals but this may be analytically preferable since it implies producer and consumer nations share benefits and costs of international trade in materials, which vary with the definition of extraction—with consequences for defining NAS. WRI and Wuppertal Institute estimate “hidden flows” of ore “lifted” from the ground (extraction) that it is not profitable to refine at prevailing prices and refining costs (production). Ore extracted but not counted as production (including post-refinement residuals) accumulates; it may be called overburden to emphasize costs like acid producing potential, or tailings to emphasize benefits like profitability in richer tailings if prices for refinery products rise relative to refining costs. In practice all lifted ore enters NAS regardless of quality and the portion that can be refined profitably, regardless of when and where lifted, moves from NAS to refineries. Mining companies that lift and refine at the same site monitor the process from extraction to refinement and quantity and quality of tailings; lift-only sites monitor extraction and tailings; separate refineries monitor refined product and residuals. Most reporting simplifies the process by focusing on refinery output from domestic extraction +/- NAS.		

Since refineries may process imported ore, their output is not solely from domestic extraction +/- NAS. Customs reports on exports and imports of metals and minerals don't identify crude ore by whether it comes from current extraction or tailings and may commingle crude and semi-refined product. Again, reporting is usually simplified down to refined content with estimates for crude ore shipped. It is thus possible for exports to exceed extractions (drawing down tailings) or be a fraction of extractions even if crude ore is shipped and NAS is zero (if export quantity is estimated refined content while extractions refer to actual tonnage lifted). DMI is a more robust indicator than consumption of metals and minerals because it minimizes such accounting problems.

Even if the numerator properly accounted for metals and minerals in terms of refined content it would give a distorted view of the material intensity of economic activity. A country deriving most of its value added (GDP) from mining and exporting all it extracts would be shown as having low material intensity of GDP. This is as misleading as indicating low material intensity in countries that depend almost entirely on imported metals and minerals. The problem is failure to view GDP in terms of the P=I=E tautology. GDP in both countries of extraction and consumption depends on the same material flow although it is hard to trace in the latter since it involves intermediate consumption, netted out in calculating GDP. DMI is a more analytically useful indicator than consumption of metals and minerals because it is equally meaningful in countries of extraction and consumption.

While the CSD Methodology Sheet seeks a measure whose numerator is in physical terms, practical and analytic reasons led to use of a value measure in the RioJo Dashboard. On the practical side differences between volume and weight measures can be significant; UNCTAD's online reports on trade in metals and minerals are only in value terms. And since the denominator is in money terms, there is a gain in analytic clarity from expressing the

Indicator	COMENERGY	**Collection**	Rio to Johannesburg Dashboard
Indicator #	281	**Sub-Index**	
Indicator Name	Commercial Energy Use		
Units	Kilogram of oil equivalent per capita		
Reference Year	2000		
Source	US DOE Energy Information Administration		
Methodology	Commercial energy use refers to apparent consumption, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transportation.		

Indicator	ENRGYINT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	282	**Sub-Index**	
Indicator Name	Energy Intensity of GDP		
Units	Kilogram of oil equivalent per dollar of GDP.		
Reference Year	circa 2000		
Source	US DOE Energy Information Administration		
Methodology	GDP per unit of energy use is the U.S. dollar estimate of real GDP (at 1995 prices) per kilogram of oil equivalent of commercial energy use. Commercial energy use refers to apparent consumption, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transportation.		

Indicator	SOLWAST	**Collection**	Rio to Johannesburg Dashboard
Indicator #	283	**Sub-Index**	
Indicator Name	Adequate solid waste disposal		
Units	Percent of total waste disposal		
Reference Year	1998		
Source	UN-Habitat database, http://www.unhabitat.org/guo/gui/index.html		
Methodology	While the CSD Thematic Framework calls for a measure of municipal and industrial waste, the lead agency for this indicator (UN-Habitat) only reports city-level data on percent distribution of municipal waste disposal by process. The RioJo Dashboard distils these into (unweighted) averages for a country's reporting cities of forms considered adequate (recycling, sanitary landfill, and incineration) for this exercise; open dumps, open burning, and other disposal are inadequate forms. UN-Habitat reports refer to two surveys (1993, 1998) presented as 1990 and 2000, respectively, in the RioJo Dashboard. Hence, trends between the two surveys refer at best to half the intended time. If a country surveyed some city in 1993 but not 1998, RioJo Dashboard's standard for use of carry-forward means it shows the single (1993) report as both 1990 and 2000. Cell-level comments flag where only one or two cities participated in the surveys and simple use of this carry-forward standard. Where surveys cover different cities in 1993 and 1998, a more complex carry-forward is required to minimize noise in inter-temporal comparisons. Assuming differences are greater across surveyed cities than over time, the pool of cities for a country is gap-filled by carrying back 1998 estimates as well as carrying 1993 cities forward. Conceptually, country results should be population-weighted averages of city surveys. However, this presumes survey respondents are a representative sample of a country's cities while a cursory review suggests surveys are skewed toward most populous cities. Use of an unweighted average of respondents minimizes this bias by assigning greater relative weight to less populous cities.		

Indicator	HAZWAST	**Collection**	Rio to Johannesburg Dashboard
Indicator #	284	**Sub-Index**	
Indicator Name	Hazardous waste generate		
Units	Grams per US$ GDP		
Reference Year	Most recent estimate		
Source	Basel Convention Country Fact Sheets European Environmental Agency on Hazardous Waste, http://reports.eea.eu.int/topic_report_2001_14/en UNDP		
Methodology	The CSD Methodology Sheet identifies the Secretariat to the Basel Convention as lead agency and specifies presentation either in tonnes or tonnes per unit of GDP. Online reports by the Secretariat, in metric tons, are expressed in grams per US$ of GNP as estimated for this exercise, where available. In a few cases, flagged by pop-up notes in the Dashboard, the numerator is from 1998 reports to the Secretariat and refers to hazardous and other waste; or from UNDP reports which may also refer to this broader category. Available data referring to 1990 are too sparse to report.		

Indicator	WASTREC	**Collection**	Rio to Johannesburg Dashboard
Indicator #	285	**Sub-Index**	
Indicator Name	Waste Recycling as a Percentage of Waste Disposal		
Units	Percentage of total waste disposal		
Reference Year	1998		
Source	UN-Habitat database, http://www.unhabitat.org/guo/gui/index.html		

Methodology

While the CSD Thematic Framework calls for a measure of municipal and industrial waste, the lead agency for this indicator (UN-Habitat) only reports city-level data on percent distribution of municipal waste disposal by process. The RioJo Dashboard distils these into (unweighted) averages for a country's reporting cities of forms considered adequate (recycling, sanitary landfill, and incineration) for this exercise; open dumps, open burning, and "other" disposal are inadequate forms.

UN-Habitat reports refer to two surveys (1993, 1998) presented as 1990 and 2000, respectively, in the RioJo Dashboard. Hence, trends between the two surveys refer at best to half the intended time. If a country surveyed some city in 1993 but not 1998, RioJo Dashboard's standard for use of carry-forward means it shows the single (1993) report as both 1990 and 2000. Cell-level comments flag where only one or two cities participated in the surveys and simple use of this carry-forward standard.

Where surveys cover different cities in 1993 and 1998, a more complex carry-forward is required to minimize noise in inter-temporal comparisons. Assuming differences are greater across surveyed cities than over time, the pool of cities for a country is gap-filled by carrying back 1998 estimates as well as carrying 1993 cities forward. Conceptually, country results should be population-weighted averages of city surveys. However, this presumes survey respondents are a representative sample of a country's cities while a cursory review suggests surveys are skewed toward most populous cities. Use of an unweighted average of respondents minimizes this bias by assigning greater relative weight to less populous cities.

Indicator	INTERNT	**Collection**	Rio to Johannesburg Dashboard
Indicator #	286	**Sub-Index**	
Indicator Name	Internet Subscribers per 1000 Inhabitants		
Units	Number of hosts per 1000 Inhabitants		
Reference Year	2001		
Source	International Telecommunication Union, World Telecommunication De-velopment Report, early years reported via WB SIMA		

Methodology

Given the newness of the Internet and its explosive growth in recent years, the time periods considered here have been adjusted relative to the conventions used elsewhere in the RioJo Dashboard. In 1990, the Internet was used almost entirely by scientists in a few countries. For the present exercise, 1990 refers to the earliest user estimate, up to 1994. For countries that only begin reporting after 1994, Internet usage was almost certainly negligible in those early years and is shown as zero. To reflect the dramatic rise in Internet usage in many developing countries in the very recent past, ITU data for 2001 are shown as 2000 in this exercise (falling back on 2000 or 1999 data in a few cases).

Indicator	MPHONE	**Collection**	Rio to Johannesburg Dashboard
Indicator #	287	**Sub-Index**	
Indicator Name	Main Phone Lines		
Units	Number of mainlines per 1000 population		
Reference Year	2001		
Source	International Telecommunication Union, World Telecommunication Development Report, reported via WB SIMA.		
Methodology	Number of telephone exchange mainlines per 1000 persons. A telephone mainline connects the subscriber's equipment to the switched network and has a dedicated port in the telephone exchange. Note that for most countries, main lines also include public payphones.		

Indicator	RDEXP	**Collection**	Rio to Johannesburg Dashboard
Indicator #	288	**Sub-Index**	
Indicator Name	Research and Development Expenditures		
Units	Percentage of GNP		
Reference Year	1997		
Source	UNESCO UIS World Bank SIMA and WDI online		
Methodology	Expenditures on any creative, systematic activity undertaken to increase the stock of knowledge (including knowledge of people, culture and society) and the use of this knowledge to devise new applications. Included are fundamental research, applied research, and experimental development work leading to new devices, products, or processes. Total expenditures for R&D comprise current expenditure, including overhead, and capital expenditure.		

Collection 5: Wellbeing of Nations

Indicator	WI	**Collection**	Wellbeing of Nations
Indicator #	289	**Sub-Index**	
Indicator Name	Wellbeing Index		
Units	The WI is the average of HWI and EWI (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 25.		
Methodology	The Wellbeing Index combines the HWI and EWI reflects a community's readiness to achieve sustainability, measuring a combination that allows the least environmental costs in exchange		

for a high quality of life for human lives.

The data identifies three integral components that contribute to a high WI score: freedom, sound governance and education.

Summary of country performance:

0	0%	Good
5	3%	Fair
86	48%	Medium
89	49%	Poor
0	0%	Bad

Details:

The Wellbeing Index (WI) is the average of HWI and EWI (HWI+EWI / 2)

The Human Wellbeing Index (HWI) is the lower of the HWI including equity (HWI + equity) and the HWI excluding equity (HWI - equity). The former is the unweighted average of indices of health and population, wealth, knowledge, community, and equity. The latter is the unweighted average of indices of health and population, wealth, knowledge, and community. Taking the lower version of the HWI prevents equity from offsetting poor performance in the other human dimensions.

The Ecosystem Wellbeing Index (EWI) is the lower of the EWI including resource use (EWI + RU) and the EWI excluding resource use (EWI - RU). The former is the unweighted average of indices of land, water, air, species and genes, and resource use. The latter is the unweighted average of indices of land, water, air, and species and genes. Taking the lower version of the EWI prevents resource use (a set of indicators of human pressure on the ecosystem) from offsetting poor performance in the other ecosystem dimensions (primarily sets of indicators of the state of the ecosystem).

Indicator HWI **Collection** Wellbeing of Nations

Indicator # 290 **Sub-Index**

Indicator Name Human Wellbeing Index

Units Composite Index (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 1.

Methodology The Human Wellbeing Index (HWI) is the average of indices of health and population, wealth, knowledge, community, and equity or average of indices of health and population, welath knowledge, and community, whichever is lower.

The resulting HWI measures the success level of the intended goals to a higher level of human well-being (with respect to the topics mentioned above).

Summary of country performance:

3	Good	(2%)
34	Fair	(19%)
52	Medium	(29%)
51	Poor	(28%)
40	Bad	(22%)

The gap between the best and worst off countries is enormous:

The median HWI of the highest 10% scoring countries is almost eight times that of the bottom 10%.

Details:

The Human Wellbeing Index (HWI) is the lower of the HWI including equity (HWI + equity) and the HWI excluding equity (HWI - equity). The former is the unweighted average of indices of health and population, wealth, knowledge, community, and equity. The latter is the unweighted average of indices of health and population, wealth, knowledge, and community. Taking the lower version of the HWI prevents equity from offsetting poor performance in the other human dimensions.

Indicator EWI **Collection** Wellbeing of Nations

Indicator # 291 **Sub-Index**

Indicator Name Ecosystem Wellbeing Index

Units Score between 0 and 100, which is taken from the lower of two scores. 1. EWI, inclduing resource use. 2. and the EWI, excluding resource use. (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 9

Methodology The Ecosystem Wellbeing Index (EWI) is the average of the following indices: land, water, species and genes, and resource use, or averageof indices of land, water, air, and species and genes, whichever is lower.

A good Ecosystem Wellbeing is a position where the ecosystem mailtains its diversity and quality, in which the country is able to support humans and other life forms, including its capacity to change and provide opportunities for adaptability, as it becomes necessary.

The EWI measures a state's tension on a wider scope of the ecosystem - inclusive of its effects on natural life outside the country's borders.

Summary of country performance:

Countries that measure a poor or bad EWI make up almost half of the worl'ds land and inland water surfaces(at 48.4%). Countries scoring a medium rank for EWI amount to 43%. Only 8.6% of the countries received a fair score.

Details:

The Ecosystem Wellbeing Index (EWI) is the lower of the EWI including resource use (EWI + RU) and the EWI excluding resource use (EWI - RU). The former is the unweighted average of indices of land, water, air, species and genes, and resource use. The latter is the unweighted average of indices of land, water, air, and species and genes. Taking the lower version of the EWI prevents resource use (a set of indicators of human pressure on the ecosystem) from offsetting poor performance in the other ecosystem dimensions (primarily sets of indicators of the state of the ecosystem).

Indicator DALE **Collection** Wellbeing of Nations

Indicator # 292 **Sub-Index**

Indicator Name Disability-adjusted life expectancy at birth

Units The life expectancy at birth minus the number of years that the new-born child could expect to live with various degrees of disability

Reference Year 2000

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 2.

Original Sources:

Mathers, Colin D., Ritu Sadana, Joshua A. Salomon, Christopher J.L. Murray, & Alan D. Lopez. 2000. Estimates of DALE for 191 countries: methods and results. Global Programme on Evidence for Health Policy Discussion Paper 16. World Health Organization, Geneva.

World Health Organization (WHO). 2000. World health report 2000. World Health Organization, Geneva.

Methodology Disability-adjusted life expectancy at birth (DALE) is an indicator of a long and healthy life but until recently was compiled in only a few countries. In 2000, the World Health Organization adopted DALE as its sole indicator of the overall health of a population, and published estimates of DALE for 191 countries (Mathers et al. 2000; World Health Organization 2000). Life expectancy at birth is the average number of years that a child born in a given year could expect to live. It is calculated from the death rates of specific age groups commonly 0-1, 1-5, and then 5-year groups for ages above 5. It reflects all the causes of death (including vehicle and other travel accidents, murders and suicides), and the death rates from those causes, that a typical person would be exposed to as she or he passes through each age group. DALE is life expectancy at birth minus the number of years that the new-born child could expect to live with various degrees of disability. It incorporates the likely incidence, duration and severity of disability. Disability includes a wide range of diseases and injuries, including neuro-psychiatric disorders. As such DALE is an excellent indicator of overall health, the healthfulness of living conditions, and the availability and effectiveness of health services. Nevertheless, it is subject to large uncertainties (actual DALE may be several years higher or lower than estimated DALE). Uncertainty ranges for each country are given in Mathers et al. (2000) and World Health Organization (2000).

Indicator HEALTH **Collection** Wellbeing of Nations

Indicator # 293 **Sub-Index**

Indicator Name The Health Index

Units The standardized score for disability adjusted life expectancy (DALE). The lowest DALE is 24 years and the highest is 79 years.

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 2.

Original Sources:

International Conference on Population and Development (Cairo, 1994) and the World Summit for Social Development (Copenhagen, 1995)

Mathers, Colin D., Ritu Sadana, Joshua A. Salomon, Christopher J.L. Murray, & Alan D. Lopez. 2000. Estimates of DALE for 191 countries: methods and results. Global Programme on Evidence for Health Policy Discussion Paper 16. World Health Organization, Geneva.

Office of the UN System Support and Services. 1996. UN Conference goals and commitments inter-related to the "DAC reflection". United Nations Development Programme, New York.

United Nations Population Division. 1997. Information note: wall chart on basic social services for all, 1977. United Nations, New York.

United Nations Population Division. 1998b. Personal communication.

UNICEF. 1999b. The state of the world's children 2000. www.unicef.org.

International Conference on Population and Development (Cairo, 1994) and the World Summit for Social Development (Copenhagen, 1995)

United Nations Statistical Division. 1999. Statistical yearbook. United Nations, New York.

World Health Organization (WHO). 2000. World health report 2000. World Health Organization, Geneva.

Methodology

The Health Index (HEALTH) examines the life expectancy, given the year of birth, in comparison to others born at that time. The life expectancy is calculated with adjustments for any time lost to disease and injury.

Summary of country performance:

27	Good	15%
32	Fair	18%
59	Medium	33%
31	Poor	17%
31	Bad	17%

The average life expectancy age for the entire planet rose by six years in twenty years, at 64.5 years of age (Data taken from Year 1999).

Details:

Health Index (Health) is the score for healthy life expectancy. They are derived from performance criteria for life expectancy at birth unadjusted for disability. The base of the scale (24 years) and the top point of the good band (79 years) encompass the current range of healthy life expectancy (from 25.8 years for males in Sierra Leone to 77.2 years for females in Japan), and are six years below the corresponding points for unadjusted life expectancy (for which the range is from 33.2 years for males in Sierra Leone to 80.9 years for females in Japan).

Indicator POP

Collection Wellbeing of Nations

Indicator # 294

Sub-Index

Indicator Name Population Index

Units Composite Index (theoretical range from 0-100, with 100 representing the highest score). The score is based on the total fertility rate, or average number of children per woman. The highest fertility rate score is 1.2 and the lowest is 8.2.

Reference Year 2000 estimate

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 2.

Original Sources:

United Nations. 1996. Indicators of sustainable development framework and methodologies. United Nations, New York.

United Nations Population Division. 1998a. World population prospects: the 1998 revision. United Nations, New York.

Methodology Population Index (POP) is represented by a single indicator: the total fertility rate (the average number of children born alive by a woman in her lifetime) derived from age-specific fertility rates (or sometimes surveys) (United Nations 1996, United Nations Population Division 1998a).

Summary of country performance:

60	Good	33%
16	Fair	9%
27	Medium	15%
35	Poor	19%
42	Bad	23

Indicator HAPI **Collection** Wellbeing of Nations

Indicator # 295 **Sub-Index**

Indicator Name Health and Population Index

Units The lower score between the Health and Population Index (theoretical range from 0-100, with 100 representing the highest score)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 2.

Methodology When comparing the HEALTH and POP Indices, it is understood that a sustainable society makes allowances so that the physical/health/economic environment is appropriate to live a long life in good health.

Because both HEALTH and POP indicate the sustainability of a society within its environment, we must take the lower of the two indices to measure HEALTH and POP. While a long life is treasured because of an implication of good health and more time to live, a longer life also gives us access to more opportunity, the stressors of overpopulation result in imbalanced consumption and therefore, a negative burden on the environment.

Summary of country performance:

26	Good	14%
22	Fair	12%
49	Medium	27%
34	Poor	19%
49	Bad	27%

Details:

The Health and Population Index (H&P) is the lower of a health index (HEALTH) and a

population index (POP). The lower score was chosen to avoid a high score for population offsetting a low score for health, and vice versa.

Indicator LOWFOOD **Collection** Wellbeing of Nations

Indicator # 296 **Sub-Index**

Indicator Name Percentage of the population with insufficient food

Units percentage

Reference Year 1995-1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1996a. The Sixth World Food Survey, 1996. Food and Agriculture

Food and Agriculture Organization of the United Nations (FAO). 1999b. The state of food insecurity in the world. Food and Agriculture Organization of the United Nations, Rome.

Methodology LOWFOOD is the percentage of the population with insufficient food. Insufficient food means food consumption below minimum energy requirement. Data are for 1995-1997 and are from FAO (1999b). They were estimated from food supply data (derived from production and trade data) and household surveys (FAO 1996a).

Indicator STUNT **Collection** Wellbeing of Nations

Indicator # 297 **Sub-Index**

Indicator Name Prevalence of Stunted Children

Units percentage

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Original Sources:

Onis, Mercedes de, & Monika Blössner. 1997. WHO global database on child growth and malnutrition. World Health Organization, Geneva.

UNICEF. 1999b. The state of the world's children 2000. www.unicef.org.

World Health Organization (WHO). 1998b. Health for all in the twenty-first century. Document A51/5. World Health Organization, Geneva.

Visschedjik, Jan, & Sylvère Siméant. 1998. Targets for health for all in the 21st century. World Health Statistics Quarterly 51 (1): 56-67.

World Health Organization (WHO). 1998b. Health for all in the twenty-first century. Document A51/5. World Health Organization, Geneva.

Methodology STUNT is the prevalence of stunting [percentage] of children under five years with low height-for-age. The World Health Organization (WHO) regards height-for-age as the best

indicator for monitoring child growth, because it measures cumulative deficient growth associated with long term factors, including chronic insufficient daily food intake, frequent infection, and poor feeding practices (Visschedjik & Siméant 1998; World Health Organization

Indicator UNDERWT **Collection** Wellbeing of Nations

Indicator # 298 **Sub-Index**

Indicator Name Under Weight Percentage

Units percentage

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Original Sources:

Onis, Mercedes de, & Monika Blössner. 1997. WHO global database on child growth and malnutrition. World Health Organization, Geneva.

UNICEF. 1999b. The state of the world's children 2000. www.unicef.org.

World Health Organization (WHO). 1996-1998a. WHO Health-for-All database (data from WHO member states and regional offices). World Health Organization, Geneva.

Methodology Under Weight Percentage (UNDERWT) is the prevalence of low weight-for-age in children under five years.

Note to the original table: Data are for the latest year available and are from Onis & Blössner (1997), if indicated by the letter h, or UNICEF (1999b), if indicated by the letter c. Data are for the latest year in the period 1990-1997 and are from UNICEF (1999b), if indicated by the letter c, or World Health Organization (1996-1998a), if indicated by the latter h. A score with an asterisk (*) has been reduced in acordance with the insufficient data.

Indicator LOWBWT **Collection** Wellbeing of Nations

Indicator # 299 **Sub-Index**

Indicator Name Low Birth Weight Percentage

Units percentage

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Original Sources:

Onis, Mercedes de, & Monika Blössner. 1997. WHO global database on child growth and malnutrition. World Health Organization, Geneva.

UNICEF. 1999b. The state of the world's children 2000. www.unicef.org.

World Health Organization (WHO). 1996-1998a. WHO Health-for-All database (data from WHO member states and regional offices). World Health Organization, Geneva.

Methodology Low Birth Weight Percentage (LOWBWT) is the percentage of babies whose birth weight is

less than 2500 grams, as a percentage of babies born alive.

Note to the original table: Data are for the latest year available and are from Onis & Blössner (1997), if indicated by the letter h, or UNICEF (1999b), if indicated by the letter c. Data are for the latest year in the period 1990-1997 and are from UNICEF (1999b), if indicated by the letter c, or World Health Organization (1996-1998a), if indicated by the latter h. A score with an asterisk (*) has been reduced in acordance with the insufficient data.

Indicator FOODSC **Collection** Wellbeing of Nations

Indicator # 300 **Sub-Index**

Indicator Name Food Sufficiency Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1996a. The Sixth World Food Survey, 1996. Food and Agriculture

Food and Agriculture Organization of the United Nations (FAO). 1999b. The state of food insecurity in the world. Food and Agriculture Organization of the United Nations, Rome.

Fourth World Conference on Women (Beijing, 1995)

Onis, Mercedes de, & Monika Blössner. 1997. WHO global database on child growth and malnutrition. World Health Organization, Geneva.

Second World Conference on Human Settlements (Habitat II, Istanbul, 1996)

United Nations. 1996. Indicators of sustainable development framework and methodologies. United Nations, New York.

UNICEF. 1999b. The state of the world's children 2000. www.unicef.org.

United Nations Development Programme. 2000. Human development report 2000. Oxford University Press, New York & Oxford.

United Nations Statistical Division. 1999. Statistical yearbook. United Nations, New York.

Visschedjik, Jan, & Sylvère Siméant. 1998. Targets for health for all in the 21st century. World Health Statistics Quarterly 51 (1): 56-67.

World Bank. 2000a. World development indicators 2000. World development indicators on CD-ROM. The World Bank, Washington, DC.

World Health Organization (WHO). 1998b. Health for all in the twenty-first century. Document A51/5. World Health Organization, Geneva.

World Summit for Social Development (Copenhagen, 1995)

Methodology FOODSC is the food sufficiency score. The performance criteria for the food indicators are shown in Table 3a of the report (p. 161). For stunting, the top of the medium band corresponds to the WHO target of less than 20% in all countries by 2010 (World Health Organization 1998b;

Visschedjik & Siméant 1998). For low weight-for-age children and low birth-weight babies, the top of the fair band corresponds to the general target of WHO's General Strategy for Health of no more than 10% (United Nations 1996). The criteria for percentage of the population with insufficient food match those for the other food indicators.

Note to the original table:

Data are for the latest year available and are from Onis & Blössner (1997), if indicated by the letter h, or UNICEF (1999b), if indicated by the letter c.

Data are for the latest year in the period 1990-1997 and are from UNICEF (1999b), if indicated by the letter c, or World Health Organization (1996-1998a), if indicated by the latter h.

A score with an asterisk (*) has been reduced in acordance with the insufficient data.

Indicator NEEDSC **Collection** Wellbeing of Nations

Indicator # 301 **Sub-Index**

Indicator Name Needs Score

Units The lower of two scores: Food Sufficiency and Basic Services Score (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 3.

Methodology Need Score (NEEDSC) is the lower of the food sufficiency and basic services scores.

Indicator ECONSZSC **Collection** Wellbeing of Nations

Indicator # 302 **Sub-Index**

Indicator Name Size of the Economy Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2000

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 4.

Methodology Size score = size of economy score, based on GDP/person, in current international purchasing power parity dollars (or, exceptionally, in current US dollar).

Indicator DEBTSC **Collection** Wellbeing of Nations

Indicator # 303 **Sub-Index**

Indicator Name Debt Score

Units Unitless scale (0 is the worst possible score and 100 is the best) representing the lower of the external debt and public debt scores.

Reference Year 2000

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 4.

Original Sources:

BIS/IMF/OECD/World Bank 2000. Joint BIS-IMF-OECD-World Bank statistics on external debt. Bank for International Settlements, International Monetary Fund, Organisation for Economic Co-operation and Development & The World Bank Group. www.oecd.org/dac/debt/htm.

Black, John. 1997. A Dictionary of Economics. Oxford University Press, Oxford & New York.

The Economist 1999

Eurostat. 2000. GDP and government finances in the EU. Eurostat, Luxembourg.

International Institute for Strategic Studies. 1999a. The military balance 1999/2000. Oxford University Press for the International Institute for Strategic Studies, London.

International Labour Office. 2000. LABORSTA: Labour Statistcs Database. http://laborsta.ilo.org/.

Sachs, Jeffrey D., & Wing Thye Woo. 1999. Executive summary: The Asian financial crisis: what happened, and what is to be done. Asia Competitiveness Report 1999. World Economic Forum, www.weforum.org.

United Nations Economic Commission for Europe. 2000. Statistics on unemployment. www.unece.org/stats/data.htm.

World Bank. 1999a. World development indicators 1999. World development indicators on CD-ROM. The World Bank, Washington, DC.

World Bank. 1999b. Global development finance 1999. Global development finance on CD-ROM. The World Bank, Washington, DC.

World Bank. 2000b. Global development finance 2000. Global development finance on CD-ROM. The World Bank, Washington, DC.

Methodology

Debt Score = the lower of the external debt and public debt scores. The external debt score is of the lowest score of present value of external debt service as a % of exports of goods and services, or present value of external debt service as a % of GNP, or the ratio of short-term debt to international reserves. The public debt score is the weighted average [weights in brackets] of the scores for gross public debt as % of GDP [2] and annual central government deficit/surplus as % of GDP [1].

The performance criteria are shown in Table 4a of the original table (p. 165). For the two debt service indicators, the tops of bad and poor match the points at which the World Bank classifies a country as severely and moderately indebted respectively (World Bank 2000b). For the ratio of short-term debt to international reserves, the top of medium is the benchmark suggested by IMF Policy Development and Review Department (2000) for the reverse indicator—the ratio of international reserves to short-term debt. The benchmark is less applicable to economies (such as those of industrialized countries), in which much of the private sector has unrestricted access to international capital markets, and which typically have ratios that would qualify as poor or bad according to these criteria. In less open or well regulated markets, the benchmark (a ratio of 1.0) matches the point above which a country is vulnerable to creditor panic, according to Sachs & Woo (1999). For the public debt and deficit indicators, the top of medium matches the Treaty of Maastricht's criteria of no more than 60% for an acceptable ratio of government debt to GDP and no more than 3% for an acceptable budget deficit (Black 1997).

Indicator	NTLWTHSC	**Collection**	Wellbeing of Nations
Indicator #	304	**Sub-Index**	

Indicator Name National Wealth Index Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 4.

Methodology National Wealth Index Score = the average of three weighted indicators: Size of the economy (Size score), inflation and unemployment score (IU score), and debt (Debt score).

Size of the economy represented by Gross Domestic Product (GDP) per person, inflation and unemployment represented by the annual inflation rate or the annual unemployment rate for the same period (whichever gives the lower score), and debt score, represented by an external debt indicator or a public debt indicator (whichever gives the lower score)

Indicator ESC **Collection** Wellbeing of Nations

Indicator # 305 **Sub-Index**

Indicator Name Education Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 5.

Original sources:

UNESCO. 1999b. Net enrolment rates. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

UNESCO. 1999c. Number of tertiary students per 100 000 inhabitants. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

Methodology Education Score is the average of two unweighted indicators: primary and secondary school enrollment, the unweighted average score of the net primary school enrollment rate, the net secondary enrollment rate, and tertiary school enrollment per 10,000 population.

Indicator COMSC **Collection** Wellbeing of Nations

Indicator # 306 **Sub-Index**

Indicator Name Communication Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year late 1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 5.

Original Sources:

International Telecommunication Union. 1997. Yearbook of statistics: telecommunication services 1986-1995. International Telecommunication Union, Geneva.

International Telecommunication Union. 1998. World telecommunication development report 1998. International Telecommunication Union, Geneva.

International Telecommunication Union. 2000. Data tables on basic indicators, cellular subscribers, and Internet indicators, January 2000. Personal communication, Telecommunication Development Bureau, International Telecommunication Union, Geneva.

Methodology Communication Score is the average score of two unweighted inidcators: a telephone indicator, represented by the lower score of main telephone lines and cellular phone subscribers per 100 persons, fault per 100 main telephone lines per year, and internet users

Indicator KI **Collection** Wellbeing of Nations

Indicator # 307 **Sub-Index**

Indicator Name Knowledge Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 5.

Methodology Knowledge Index = is the average of two weighted indicators: an education score (ESC) and a communication score (CSC). Education has a higher weight than communication because the quality of communication depends on education.

Indicator FGSC **Collection** Wellbeing of Nations

Indicator # 308 **Sub-Index**

Indicator Name Freedom and Governance Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 6.

Original Sources:

Freedom House. 2000a. Freedom in the world, 1998-1999. Freedom House, New York.

Freedom House. 2000b. Press freedom survey, 1999. Freedom House, New York.

International Institute for Strategic Studies. 1999a. The military balance 1999/2000. Oxford University Press for the International Institute for Strategic Studies, London.

Transparency International. 1999. 1999 Corruption Perceptions Index. www.gwdg.de/~uwvw/1999Data.html.

Transparency International. 2000. The 2000 corruption perceptions index. Transparency International, Berlin. www.transparancy.de/documents/cpi/2000/

Methodology Freedom and Governance Score is the average of four unweighted indicators: political rights rating (PRR), civil liberties rating (CLR), press freedom rating (PFR), and corruption perceptions index (CPI).

The PFR and CPI overlap with the CLR, which includes press freedom and corruption. However, all four indicators are used because each has its own strengths. The PRR and CLR together cover almost all aspects of human rights and freedoms, but the basis of each rating is not disclosed. The PFR and CPI cover only one aspect each, but the basis of each rating is fully described.

Indicator POSC **Collection** Wellbeing of Nations

Indicator # 309 **Sub-Index**

Indicator Name Peace and Order Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 6.

Original Sources:

Freedom House. 2000a. Freedom in the world, 1998-1999. Freedom House, New York.

Freedom House. 2000b. Press freedom survey, 1999. Freedom House, New York.

International Institute for Strategic Studies. 1999a. The military balance 1999/2000. Oxford University Press for the International Institute for Strategic Studies, London.

Transparency International. 1999. 1999 Corruption Perceptions Index. www.gwdg.de/~uwvw/1999Data.html.

Transparency International. 2000. The 2000 corruption perceptions index. Transparency International, Berlin. www.transparancy.de/documents/cpi/2000/

Methodology Peace and Order Score is the average of two unweighted indicators: peace, represented by deaths from armed conflicts per year or military expenditure as a percentage of Gross Domestic Product, whichever gives the lower score, and crime, represented by the unweighted average of the homicide rate and other violent crimes.

Indicator CI **Collection** Wellbeing of Nations

Indicator # 310 **Sub-Index**

Indicator Name Community Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 6.

Original Sources:

Freedom House. 2000a. Freedom in the world, 1998-1999. Freedom House, New York.

Freedom House. 2000b. Press freedom survey, 1999. Freedom House, New York.

International Institute for Strategic Studies. 1999a. The military balance 1999/2000. Oxford University Press for the International Institute for Strategic Studies, London.

Transparency International. 1999. 1999 Corruption Perceptions Index. www.gwdg.de/~uwvw/1999Data.html.

Transparency International. 2000. The 2000 corruption perceptions index. Transparency International, Berlin. www.transparancy.de/documents/cpi/2000/

Methodology Community Index is the lower of a freedom and governace score and a peace and order score. See Freedom and Governance Score and Peace and Order Score.

Indicator CRMSC **Collection** Wellbeing of Nations

Indicator # 311 **Sub-Index**

Indicator Name Crime Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 7.

Original Sources:

Canadian Centre for Justice Statistics. 1999. Uniform crime reporting survey. Statistics Canada, Ottawa.

Federal Bureau of Investigation. 1999. Uniform crime reports: crime in the United States 1997. Department of Justice, Washington, DC.

United Nations Crime Prevention and Criminal Justice Division. 1997. 4th UN Survey of Crime Trends and Operations of Criminal Justice Systems. United Nations, Vienna.

United Nations Crime Prevention and Criminal Justice Division. 1999. 5th UN Survey of Crime Trends and Operations of Criminal Justice Systems. United Nations, Vienna.

Methodology Crime Score is the average of two unweighted indicators: homicide rate and other violent crimes. The unweighted average of scores for the rape rate, robbery rate, and assault rate. Homicides are distinguished from other violent crimes because they are more serious and are reported less inconsistently. Homicides include intentional homicides (murder) and unintentional homicides (manslaughter, except as a result of traffic accidents). Rape is sexual intercourse without valid consent. Robbery is the use of force or the threat of force to steal property. Assault is physical attack against the body of another person, other than rape or robbery.

All data are from United Nations Crime Prevention and Criminal Justice Division (1997 & 1999), except for Canada, which are from Canadian Centre for Justice Statistics (1999), and the United States which are from Federal Bureau of Investigation (1999). Rates are per 100,000 population.

Indicator HESC **Collection** Wellbeing of Nations

Indicator # 312 **Sub-Index**

Indicator Name Household Equity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 8.

Original Resources:

Inter-Parliamentary Union. 2000. Women in national parliaments. www.ipu.org.

UNESCO. 1999b. Net enrolment rates. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

UNESCO. 1999c. Number of tertiary students per 100 000 inhabitants. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

United Nations Development Programme. 2000. Human development report 2000. Oxford University Press, New York & Oxford.

United Nations Division for the Advancement of Women. 1996. Fact sheet on women in government as at January 1996. United Nations, New York.

Methodology Household Equity Score consists of a single indicator: the ratio of the richest 20%'s income share to the poorest 20%.

Indicator GESC **Collection** Wellbeing of Nations

Indicator # 313 **Sub-Index**

Indicator Name Gender Equity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 8.

Original Resources:

Inter-Parliamentary Union. 2000. Women in national parliaments. www.ipu.org.

UNESCO. 1999b. Net enrolment rates. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

UNESCO. 1999c. Number of tertiary students per 100 000 inhabitants. Personal communication, UNESCO Institute for Statistics, United Nations Educational, Scientific and Cultural Organization, Paris.

United Nations Development Programme. 2000. Human development report 2000. Oxford University Press, New York & Oxford.

United Nations Division for the Advancement of Women. 1996. Fact sheet on women in government as at January 1996. United Nations, New York.

Methodology Gender Equity Score is the average of three unweighted indicators: gender and wealth, represented by the ration of male income to female income, gender and knowledge, represented by the average difference between the male and female school enrollment rates, and gender and community, represented by the percentage of women in the national parliament.

Indicator	EI	**Collection**	Wellbeing of Nations
Indicator #	314	**Sub-Index**	
Indicator Name	Equity Index		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 8. Original Resources: Inter-Parliamentary Union. 2000. Women in national parliaments. www.ipu.org. United Nations Development Programme. 2000. Human development report 2000. Oxford University Press, New York & Oxford. United Nations Division for the Advancement of Women. 1996. Fact sheet on women in government as at January 1996. United Nations, New York.		
Methodology	Equity Index is the unweighted average of a household equity score (HESC) and a gender equity schore (GESC).		

Indicator	LANDDSC	**Collection**	Wellbeing of Nations
Indicator #	315	**Sub-Index**	
Indicator Name	Land Diversity Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 10. Original Sources: Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome. Food and Agriculture Organization of the United Nations (FAO). 1999b. The state of food insecurity in the world. Food and Agriculture Organization of the United Nations, Rome. Food and Agriculture Organization of the United Nations (FAO). 1999c. Irrigation in Asia in figures. Water Reports 18. Food and Agriculture Organization of the United Nations, Rome. OECD Centre for Co-operation with the Economies in Transition. 1996. Environmental information systems in the Russian Federation: an OECD assessment.Organisation for Economic Co-operation and Development, Paris.		
Methodology	Land Diversity Score is the average of two weighted indicators: land modification and conversion and land protection.		

Indicator	LANDQSC	**Collection**	Wellbeing of Nations
Indicator #	316	**Sub-Index**	
Indicator Name	Land Quality Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 10. Original Sources: Oldeman, L.R. 1993. An international methodology for an assessment of soil degradation and georeferenced soils and terrain database. International Soil Reference and Information Centre, Wageningen, Netherlands. Oldeman, L.R., R.T.A.Hakkeling, & W.G.Sombroek. 1991. World map of the status of human-induced soil degradation: an explanatory note. 2nd revised edition. International Soil Reference and Information Centre, Wageningen (Netherlands), & United Nations Environment Programme, Nairobi. Van Lynden, G.W.J., & L.R.Oldeman. 1997. The assessment of the status of human-induced soil degradation in South and Southeast Asia. United Nations Environment Programme, Food and Agricultural Organization of the United Nations, & International Soil Reference and Information Centre, Nairobi, Rome, & Wageningen (Netherlands). UNEP/ISRIC. 1990. World map on status of human-induced soil degradation. United Nations Environment Programme, Nairobi.		
Methodology	Land Quality Score consists of one indicator: the area of degraded land as a percentage of the area of cultivated and modified land, weighted according to severity of degradation.		

Indicator	LI	**Collection**	Wellbeing of Nations
Indicator #	317	**Sub-Index**	
Indicator Name	Land Index		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 10. Original Sources: Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome. Food and Agriculture Organization of the United Nations (FAO). 1999b. The state of food insecurity in the world. Food and Agriculture Organization of the United Nations, Rome. Food and Agriculture Organization of the United Nations (FAO). 1999c. Irrigation in Asia in figures. Water Reports 18. Food and Agriculture Organization of the United Nations, Rome. OECD Centre for Co-operation with the Economies in Transition. 1996. Environmental		

information systems in the Russian Federation: an OECD assessment.Organisation for Economic Co-operation and Development, Paris.

Methodology Land Index is the lower of a land diversity score and a land quality score.

Indicator WWSC **Collection** Wellbeing of Nations

Indicator # 318 **Sub-Index**

Indicator Name Water Withdrawl Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 14.

Original Sources:

World Energy Council. 1999. Survey of Energy Resources. World Energy Council, London.

Eurostat. 1997. Indicators of sustainable development: a pilot study following the methodology of the United Nations Commission on Sustainable Development. European Communities, Luxembourg.

Eurostat. 2000. GDP and government finances in the EU. Eurostat, Luxembourg.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

Eurostat, European Commission, European Environment Agency Task Force, DG XI and PHARE European Commission, United Nations Economic Commission for Europe, Organisation for Economic Cooperation and Development, & World Health Organization. 1995.

Food and Agriculture Organization of the United Nations (FAO). 1995a. Irrigation in Africa in figures. Water Reports 7.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995b. Water resources of African countries: a review.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997b. Irrigation in the Near East region in figures. Water Reports 9. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997c. Irrigation in the countries of the former Soviet Union in figures. Water Reports 15. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997d. Irrigation potential in

Africa. FAO Land and Water Bulletin 4. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1998a

Food and Agriculture Organization of the United Nations (FAO). 1999c. Irrigation in Asia in figures. Water Reports 18. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000b. Irrigation in Latin

America in figures. Water Reports in press. Food and Agriculture Organization of the United Nations, Rome.

Instituto Nacional de Estadística, Geografía e Informática. 1998. Estadísticas del medio ambiente, México, 1997. Secretaría de Medio Ambiente, Recursos Naturales y Pesca, México.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris.

World Resources Institute, United Nations Environment Programme, United Nations Development Programme, & World Bank. 1998. World Resources 1998-99. Oxford University Press, New York & Oxford.

Methodology Water Withdrawal Score = annual withdrawals of ground and surface water for domestic, agricultural, and industrial uses, in cubic kilometers per year (km^3/y)

Indicator WQSC **Collection** Wellbeing of Nations

Indicator # 319 **Sub-Index**

Indicator Name Water Quality Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 14.

Original Sources:

World Energy Council. 1999. Survey of Energy Resources. World Energy Council, London.

Eurostat. 1997. Indicators of sustainable development: a pilot study following the methodology of the United Nations Commission on Sustainable Development. European Communities, Luxembourg.

Eurostat. 2000. GDP and government finances in the EU. Eurostat, Luxembourg.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

Eurostat, European Commission, European Environment Agency Task Force, DG XI and PHARE European Commission, United Nations Economic Commission for Europe, Organisation for Economic Cooperation and Development, & World Health Organization. 1995.

Food and Agriculture Organization of the United Nations (FAO). 1995a. Irrigation in Africa in

figures. Water Reports 7.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995b. Water resources of African countries: a review.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997b. Irrigation in the Near East region in figures. Water Reports 9. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997c. Irrigation in the countries of the former Soviet Union in figures. Water Reports 15. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997d. Irrigation potential in Africa. FAO Land and Water Bulletin 4. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1998a

Food and Agriculture Organization of the United Nations (FAO). 1999c. Irrigation in Asia in figures. Water Reports 18. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000b. Irrigation in Latin

America in figures. Water Reports in press. Food and Agriculture Organization of the United Nations, Rome.

Instituto Nacional de Estadística, Geografía e Informática. 1998. Estadísticas del medio ambiente, México, 1997. Secretaría de Medio Ambiente, Recursos Naturales y Pesca, México.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris.

World Resources Institute, United Nations Environment Programme, United Nations Development Programme, & World Bank. 1998. World Resources 1998-99. Oxford University Press, New York & Oxford.

Shiklomanov, I.A. 1997. Comprehensive assessment of the freshwater resources of the

Methodology Water Quality Score is the average of drainage basins in each country. Each basin score is the lowest score of six indicators: oxygen balance, nutrients, acidification, suspended solids, microbial pollution, and arsenic and heavy metals.

Indicator	IWI	**Collection**	Wellbeing of Nations
Indicator #	320	**Sub-Index**	
Indicator Name	Inland Water Index		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 14.

Original Sources:

World Energy Council. 1999. Survey of Energy Resources. World Energy Council, London.

Eurostat. 1997. Indicators of sustainable development: a pilot study following the methodology of the United Nations Commission on Sustainable Development. European Communities, Luxembourg.

Eurostat. 2000. GDP and government finances in the EU. Eurostat, Luxembourg.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

Eurostat, European Commission, European Environment Agency Task Force, DG XI and PHARE European Commission, United Nations Economic Commission for Europe, Organisation for Economic Cooperation and Development, & World Health Organization. 1995.

Food and Agriculture Organization of the United Nations (FAO). 1995a. Irrigation in Africa in figures. Water Reports 7.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995b. Water resources of African countries: a review.

Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997b. Irrigation in the Near East region in figures. Water Reports 9. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997c. Irrigation in the countries of the former Soviet Union in figures. Water Reports 15. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1997d. Irrigation potential in Africa. FAO Land and Water Bulletin 4. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1998a

Food and Agriculture Organization of the United Nations (FAO). 1999c. Irrigation in Asia in figures. Water Reports 18. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000b. Irrigation in Latin America in figures. Water Reports in press. Food and Agriculture Organization of the United Nations, Rome.

Instituto Nacional de Estadística, Geografía e Informática. 1998. Estadísticas del medio ambiente, México, 1997. Secretaría de Medio Ambiente, Recursos Naturales y Pesca, México.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris.

World Resources Institute, United Nations Environment Programme, United Nations Development Programme, & World Bank. 1998. World Resources 1998-99. Oxford University Press, New York & Oxford.

Shiklomanov, I.A. 1997. Comprehensive assessment of the freshwater resources of the world. World Meteorological Organization, Geneva.

Methodology

Inland Water Index or IWI is the lowest of three sub-elements: inland water diversity, water withdrawal, and inland water quality.

Summary of country performance:

0	Good	0%
46	Fair	26%
42	Medium	23%
32	Poor	18%
52	Bad	29%
8	No Data	4%

Details:

The objecitve is the measure of success for "all major aquatic ecosystems maintained or restored in large units with minimal loss of the communities and habitats within them and minimal stress from pollution and water uses."

Inland water diversity is represented by river conversion by dams, measured by dam capacity as % of total water supply or, if unavailable, river flow dammed for hydropower as a percentage of dammable flow. Hydropower includes large (more than 10 megawatts) and small (under 10 megawatts) schemes.

Indicator GASC **Collection** Wellbeing of Nations

Indicator # 321 **Sub-Index**

Indicator Name Global Atmosphere Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.

Original Sources:

Marland, Gregg, Tom Boden, & Robert J. Andres. 2000. National CO2 emissions from fossil-fuel burning, cement manufacture, and gas flaring 1751-1997. September 6, 2000. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

United Nations Statistical Division. 1993. Integrated environmental and economic accounting:

interim version. Handbook of National Accounting. Studies in Methods, Series F, 61. United Nations, New York.

United Nations Environment Programme. 1999. Global environment outlook 2000. United Nations Environment Programme, Nairobi.

United Nations Statistical Division. 1997. Minimum National Social Data Set (MNSDS). Endorsed by the United Nations Statistical Commission on its 29th session, 11-14 February 1997. United Nations, New York.

United Nations Statistical Division. 1999. Statistical yearbook. United Nations, New York.

Methodology Global Atmospere Score (GASC) is the lower of two indicators: greenhouse gases, prepresented by carbon dioxide emissions per person and use - production or consumption, whichever is higher - of ozone depleting substances per person.

Summary:

46	Good	26%
43	Fair	24%
30	Medium	17%
34	Poor	19%
26	Bad	14%
1	No Data	1%

Indicator LASC **Collection** Wellbeing of Nations

Indicator # 322 **Sub-Index**

Indicator Name Local Air Quality Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.

Original Sources:

Marland, Gregg, Tom Boden, & Robert J. Andres. 2000. National CO2 emissions from fossil-fuel burning, cement manufacture, and gas flaring 1751-1997. September 6, 2000. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

United Nations Statistical Division. 1993. Integrated environmental and economic accounting: interim version. Handbook of National Accounting. Studies in Methods, Series F, 61. United Nations, New York.

United Nations Environment Programme. 1999. Global environment outlook 2000. United Nations Environment Programme, Nairobi.

United Nations Statistical Division. 1997. Minimum National Social Data Set (MNSDS). Endorsed by the United Nations Statistical Commission on its 29th session, 11-14 February 1997. United Nations, New York.

United Nations Statistical Division. 1999. Statistical yearbook. United Nations, New York.

Methodology

Local Air Quality Score is the average of city scores in each country, each city score being the lowest score of six indicators: sulfure dioxide, nitrogen dioxide, ground-level ozone, carbon monoxide, particulates, and lead.

Summary:

0	Good	0%
12	Fair	7%
27	Medium	15%
12	Poor	7%
2	Bad	1%
127	No Data	71%

Details:

Particulates are "tiny solid or liquid that damage health and reduce visibility."

"All six pollutants listed above, are hazards to health. The main source of contaminants in the measurements is road transport. The fair scores should be treated cautiously since none reflects measurement of all six pollutants in a representative sample of cities."

Note that although the measurement of local air quality is very important, the above statistics demonstrate that the is an alarmingly large percentage of countries that do not have data, or it is insufficient for meausurements.

We have included this indicator to bring attention to the gross lack of data on a key component of the ecosystem's wellbeing.

Indicator AI

Collection Wellbeing of Nations

Indicator # 323

Sub-Index

Indicator Name Air Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.

Original Sources:

Marland, Gregg, Tom Boden, & Robert J. Andres. 2000. National CO2 emissions from fossil-fuel burning, cement manufacture, and gas flaring 1751-1997. September 6, 2000. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

United Nations Statistical Division. 1993. Integrated environmental and economic accounting: interim version. Handbook of National Accounting. Studies in Methods, Series F, 61. United Nations, New York.

United Nations Environment Programme. 1999. Global environment outlook 2000. United Nations Environment Programme, Nairobi.

United Nations Statistical Division. 1997. Minimum National Social Data Set (MNSDS). Endorsed by the United Nations Statistical Commission on its 29th session, 11-14 February 1997. United Nations, New York.

United Nations Statistical Division. 1999. Statistical yearbook. United Nations, New York.

Methodology Air Index is the lower of a global atmosphere score and a local air quality score.

Summary of country performance:

0	Good	0%
82	Fair	46%
27	Medium	15%
42	Poor	23%
28	Bad	16%
1	No Data	1%

Details:

Due to a "lack of data on local air quality all of the countries with a 'Fair' air index and 15 with a 'Medium' index were assessed on global atmosphere alone."

Indicator WDSC **Collection** Wellbeing of Nations

Indicator # 324 **Sub-Index**

Indicator Name Wild Diversity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

Guveya, Emmanuel, Freddie Kachote & Misael Kokwe. 1999. A wellbeing assessment of Mangisai, Nyevera and Sedeya communities in Zimuto Communal Lands, Zimbabwe. IUCN–The World Conservation Union Regional Office for Southern Africa, Harare, Zimbabwe.

Reid, Walter V., & Kenton R. Miller. 1989. Keeping options alive: the scientific basis for conserving biodiversity. World Resources Institute, Washington, DC.

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology Wild Diversity Score is the average of two unweighted indicators: threatened wild plant species in a group as percentage of total wild plant species in that group and threatened wild animal species in a group as percentage of total wild animal species in that group.

Summary

0	Good	0%
28	Medium	16%
77	Fair	43%
55	Poor	31%
20	Bad	11%

Details:

"The objective or high score in the WDSC is the maintanence of all native wild species and reduction of extinctions to background rates."

Wild diversity has a higher weight because it is measured in terms of species, the extinction of which represents a greater genetic loss than the extinction of breeds and varieties, the measurement units for domesticated diversity.

Indicator DDSC **Collection** Wellbeing of Nations

Indicator # 325 **Sub-Index**

Indicator Name Domesticated Diversity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

Guveya, Emmanuel, Freddie Kachote & Misael Kokwe. 1999. A wellbeing assessment of Mangisai, Nyevera and Sedeya communities in Zimuto Communal Lands, Zimbabwe. IUCN–The World Conservation Union Regional Office for Southern Africa, Harare, Zimbabwe.

Reid, Walter V., & Kenton R. Miller. 1989. Keeping options alive: the scientific basis for conserving biodiversity. World Resources Institute, Washington, DC.

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology Domesticated Diversity Score is the average of two unweighted indicators: breed diversity, represented by the number of not at risk breeds per million head of a species and threatened breeds, represented by the ratio of threatened to not at risk breeds of a species.

Details:

A high score indicates the "maintenance of as much as possible of the heritage of livestock breeds."

Indicator SGI **Collection** Wellbeing of Nations

Indicator # 326 **Sub-Index**

Indicator Name Species and Genes Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

Guveya, Emmanuel, Freddie Kachote & Misael Kokwe. 1999. A wellbeing assessment of

Mangisai, Nyevera and Sedeya communities in Zimuto Communal Lands, Zimbabwe. IUCN-The World Conservation Union Regional Office for Southern Africa, Harare, Zimbabwe.

Reid, Walter V., & Kenton R. Miller. 1989. Keeping options alive: the scientific basis for conserving biodiversity. World Resources Institute, Washington, DC.

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology Species and Genes Index, or SGI is the weighted average of a wild diversity score and a domesticated diversity score.

Summary of country performance:

0	Good	0%
19	Fair	11%
89	Medium	49%
60	Poor	33%
12	Bad	7%

Indicator EMSC **Collection** Wellbeing of Nations

Indicator # 327 **Sub-Index**

Indicator Name Energy Materials Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 22.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1993. Forest resources assessment 1990. Tropical countries. FAO Forestry Paper 112. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Pandey, Devendra. 1995. Forest resouces assessment 1990. Tropical forest plantation resources. FAO Forestry Paper 128. Food and Agriculture Organization of the United Nations, Rome.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

United Nations Population Division. 1998b. Personal communication.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

Methodology Energy and Materials Score is the lower score of two indicators: energy consumption per

hectare of total area and energy consumption per person. The energy and materials index is limited to an energy index because of a lack of data on consumption of materials and waste generation.

Indicator RSSC **Collection** Wellbeing of Nations

Indicator # 328 **Sub-Index**

Indicator Name Resources and Sectors Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 22.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1993. Forest resources assessment 1990. Tropical countries. FAO Forestry Paper 112. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Pandey, Devendra. 1995. Forest resouces assessment 1990. Tropical forest plantation resources. FAO Forestry Paper 128. Food and Agriculture Organization of the United Nations, Rome.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

United Nations Population Division. 1998b. Personal communication.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

Methodology Resource and Sectors Score is the unweighted average of three sub-elements: agriculture, fisheries, and timber.

Timber is represented by a single indicator: fellings + imports as a percentage of net annual increment; or, if that is not available, production + imports as a percentage of volume.

Indicator RUI **Collection** Wellbeing of Nations

Indicator # 329 **Sub-Index**

Indicator Name Resources Use Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 22.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1993. Forest resources assessment 1990. Tropical countries. FAO Forestry Paper 112. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1995c. Forest resources assessment 1990. Global synthesis. FAO Forestry Paper 124. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 2000a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Pandey, Devendra. 1995. Forest resouces assessment 1990. Tropical forest plantation resources. FAO Forestry Paper 128. Food and Agriculture Organization of the United Nations, Rome.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

United Nations Population Division. 1998b. Personal communication.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

Methodology Resource Use Index is the unweighted average of the energy and materials score and the resource sectors score.

Energy and Materials Score is the lower score of two indicators: energy consumption per hectare of total area and energy consumption per person.

Resource and Sectors Score is the unweighted average of three sub-elements: agriculture, fisheries, and timber.

Indicator MODTOT

Collection Wellbeing of Nations

Indicator # 330

Sub-Index

Indicator Name Total Modified Land

Units 1000s of hectares

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Beeler, Giuseppe L. 1992. Prontuario dello studioso. Istituto Editoriale Ticinese, Bellinzona, Switzerland.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities,

Luxembourg.

Food and Agriculture Organization of the United Nations (FAO). 1997a. Statistical estimates for forest cover, Forest Resources Assessment Programme. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

United Nations Statistical Commission, & Economic Commission for Europe. 1992. The environment in Europe and North America: annotated statistics 1992. United Nations, New York.

Methodology Modified land is land "that is moderately to heavily human-influenced, but not cultivated or built. Uncultivated permanent pasture is counted as modified. Otherwise this category is a residual obtained as follows: total land - natural land - cultivated land - built land = modified land."

"The proportions of the land that are converted, modified, and natural reveal the scale and rate of a society's overall impact on the ecosystem, both within and beyond its borders."

Indicator	MODPCT	**Collection**	Wellbeing of Nations
Indicator #	331	**Sub-Index**	
Indicator Name	Percentage of Modified Land		
Units	Percentage		
Reference Year	mid-1990s		

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Beeler, Giuseppe L. 1992. Prontuario dello studioso. Istituto Editoriale Ticinese, Bellinzona, Switzerland.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

Food and Agriculture Organization of the United Nations (FAO). 1997a. Statistical estimates for forest cover, Forest Resources Assessment Programme. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data:

compendium 1999. Organisation for Economic Co-operation and Development, Paris.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

United Nations Statistical Commission, & Economic Commission for Europe. 1992. The environment in Europe and North America: annotated statistics 1992. United Nations, New York.

Methodology MODPCT is the percentage of land that is modified in relation to the subtotal that is natural, cultivated, and built land.

Indicator CULTOT **Collection** Wellbeing of Nations

Indicator # 332 **Sub-Index**

Indicator Name Total cultivated land

Units 1000s of hectares

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1997a. Statistical estimates for forest cover, Forest Resources Assessment Programme. Food and Agriculture Organization of the United Nations, Rome.

Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris.

UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.

Methodology CULTOT is cultivated land = cropland + plantation forest + cultivated pasture. The areas of cropland (C), plantation forest (F) and cultivated pasture (P) are given in the Cultivated [Built] notes column.

Cropland (C) = land under permanent or temporary agricultural crops, including temporary meadows for mowing or pasture, land under market and kitchen gardens, and land temporarily fallow (under five years). Data are for 1997 and are from FAO (1999a), except for Belgium and Luxembourg which are from Organisation for Economic Co-operation and Development (1999).
Plantation forest (F) = forests that have been established artificially, usually consisting of non-indigenous species or stocks.

Cultivated pasture (P) = sown (not wild) meadows and pastures. Except for Australia, data are WoN estimates, and are either 10% of the area of permanent pasture (land used for five years or more for wild or cultivated herbaceous forage crops) or the same area as cropland, whichever is smaller. Permanent pasture data are for 1994.

In the case of Australia, FAO and OECD figures for arable land include 30 million ha of cultivated grassland. This has been subtracted from cropland and recorded separately as

cultivated pasture. The FAO and OECD figures for permanent pasture are assumed to be all uncultivated."

Indicator	PRODHA	**Collection**	Wellbeing of Nations
Indicator #	333	**Sub-Index**	
Indicator Name	Tons of food produced per hectare		
Units	Metric tons of food crop production per harvested hectare		
Reference Year	mid-1990s		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23. Original source: FAO. 1998. Food Balance Sheets and Commodities Database. FAOSTAT Database. Rome: Food and Agriculture Organiztion of the UN.		
Methodology	Metric tons of food crop production is divided by harvested hectares.		

Indicator	CULPCT	**Collection**	Wellbeing of Nations
Indicator #	334	**Sub-Index**	
Indicator Name	Percentage of Land Cultivated		
Units	Percentage		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11. Original Sources: Food and Agriculture Organization of the United Nations (FAO). 1997a. Statistical estimates for forest cover, Forest Resources Assessment Programme. Food and Agriculture Organization of the United Nations, Rome. Food and Agriculture Organization of the United Nations (FAO). 1999a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome. Organisation for Economic Co-operation and Development. 1999. OECD environmental data: compendium 1999. Organisation for Economic Co-operation and Development, Paris. UNECE & FAO. 2000. Temperate and boreal forest resource assessment 2000. United Nations Economic Commission for Europe, Geneva, and Food and Agriculture Organization of the United Nations, Rome.		
Methodology	CULTPCT is the percentage of a countries total land areas that is cultivated.		

Indicator	BLDTOT	**Collection**	Wellbeing of Nations
Indicator #	335	**Sub-Index**	
Indicator Name	Total Built Land		

Units 1000s of hectares

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Beeler, Giuseppe L. 1992. Prontuario dello studioso. Istituto Editoriale Ticinese, Bellinzona, Switzerland.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

United Nations Statistical Commission, & Economic Commission for Europe. 1992. The environment in Europe and North America: annotated statistics 1992. United Nations, New York.

Methodology Built land (BLDTOT) is land that is "occupied by buildings, transport infrastructure (roads, railways, docks, airports, etc.) and other human structures, including mines and quarries, waste tips, derelict land, and urban and suburban parks and gardens."

Indicator BLDPCT **Collection** Wellbeing of Nations

Indicator # 336 **Sub-Index**

Indicator Name Percentage of Land that is Built

Units Percentage

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 11.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Beeler, Giuseppe L. 1992. Prontuario dello studioso. Istituto Editoriale Ticinese, Bellinzona, Switzerland.

Eurostat, European Commission, & the European Environment Agency. 1998. Europe's environment: statistical compendium for the Second Assessment. European Communities, Luxembourg.

United Nations Statistical Commission, & Economic Commission for Europe. 1992. The environment in Europe and North America: annotated statistics 1992. United Nations, New York.

Methodology BLDPCT is the percentage of land that is built in relation to the subtotal that consists of natural, modified, and cultivated land.

Indicator PASIZESC **Collection** Wellbeing of Nations

Indicator # 337 **Sub-Index**

Indicator Name Protected Area Size Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 12.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Dinerstein, Eric, David M. Olson, Douglas J. Graham, Avis L. Webster, Steven A. Primm, Marnie P. Bookbinder, & George Ledec. 1995. A conservation assessment of the terrestrial ecoregions of Latin America and the Caribbean. The World Bank, Washington, DC.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

IUCN World Commission on Protected Areas & World Conservation Monitoring Centre. 1998. United Nations list of protected areas 1997. IUCN–The World Conservation Union, Gland, Switzerland, & World Conservation Monitoring Centre, Cambridge.

Ricketts, Taylor, Eric Dinerstein, David Olson, Colby Loucks, William Eichbaum, Kevin Kavanagh, Prashant Hedao, Patrick Hurley, Karen Carney, Robin Abell, & Steven Walters. 1998. A conservation assessment of the terrestrial ecoregions of North America. Volume I - the United States and Canada (prepublication draft). World Wildlife Fund, Washington, DC.

World Conservation Monitoring Centre. 1997. Biodiversity conservation in the tropics: gaps in habitat protection and funding priorities. WCMC Biodiversity Series 6. World Conservation Monitoring Centre, Cambridge, England.

Methodology The protected area is the size score (SIZESC). The performance criteria is shown in the table below.

Band	top point on scale	PA as % of total area
good	100	40
fair	80	20
medium	60	10
poor	40	5
bad	20	2.5
base	0	0

Indicator DIVSC **Collection** Wellbeing of Nations

Indicator # 338 **Sub-Index**

Indicator Name Protected Area Diversity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year mid-1990s

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 12.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Dinerstein, Eric, David M. Olson, Douglas J. Graham, Avis L. Webster, Steven A. Primm, Marnie P. Bookbinder, & George Ledec. 1995. A conservation assessment of the terrestrial ecoregions of Latin America and the Caribbean. The World Bank, Washington, DC.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

IUCN World Commission on Protected Areas & World Conservation Monitoring Centre. 1998. United Nations list of protected areas 1997. IUCN–The World Conservation Union, Gland, Switzerland, & World Conservation Monitoring Centre, Cambridge.

Ricketts, Taylor, Eric Dinerstein, David Olson, Colby Loucks, William Eichbaum, Kevin Kavanagh, Prashant Hedao, Patrick Hurley, Karen Carney, Robin Abell, & Steven Walters. 1998. A conservation assessment of the terrestrial ecoregions of North America. Volume I - the United States and Canada (prepublication draft). World Wildlife Fund, Washington, DC.

World Conservation Monitoring Centre. 1997. Biodiversity conservation in the tropics: gaps in habitat protection and funding priorities. WCMC Biodiversity Series 6. World Conservation Monitoring Centre, Cambridge, England.

Methodology The protected area diversity indicator (Div score) is intended to measure how much of each major ecosystem type occurs within protected areas. Ideally, it would use a classification of major ecosystem types that distinguished either the main vegetation types or the main groups of ecological communities. The classification needs to be consistent across countries and regions and at a scale that would provide adequate detail for small countries but not unmanageable detail for large countries. World Wildlife Fund has developed such a classification for the Americas (Dinerstein, Olson, Graham et al. 1995; Ricketts, Dinerstein, Olson et al. 1998) and has used it to assess protected area coverage of ecosystem diversity. However, the assessment was by ecoregion only, not by country and ecoregion, and so could not be used here. Asian Bureau for Conservation & World Conservation Monitoring Centre (1997) cover Southern Asia and Papua New Guinea thoroughly but in a non-standard way, particularly their treatment of totally and partially protected areas. The two assessments used here (World Conservation Monitoring Centre [1997] and Iremonger, Ravilious, & Quinton [1997]) reviewed coverage of ecosystem diversity by country and ecosystem type. World Conservation Monitoring Centre's ecofloristic zone classification is not as detailed as World Wildlife Fund's ecoregion classification. However, the detail is adequate, except for Central America and the Caribbean where only major ecofloristic zones are identifed. The forest type classification covers a narrower array of ecosystem types, and the types are crudely defined. In many countries remarkably few types are recognized (for example, only one in New Zealand). The ecofloristic zone assessment distinguishes between totally and partially protected areas; the forest type assessment does not.

Country performance summary:

9	Good	5%
39	Medium	22%
45	Fair	25%
27	Poor	15%
60	Bad	33%

"Good" and "Fair" scores go to countries that keep substantial proportions of their various land and inland water ecosystems in large totally protected areas.

Indicator LPSC **Collection** Wellbeing of Nations

Indicator # 339 **Sub-Index**

Indicator Name Land Protection Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1990

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 12.

Original Sources:

Asian Bureau for Conservation (ABC), & World Conservation Monitoring Centre (WCMC). 1997. Protected area systems review of the Indo-Malayan Realm. Asian Bureau for Conservation, Hong Kong (China) & Canterbury (England).

Dinerstein, Eric, David M. Olson, Douglas J. Graham, Avis L. Webster, Steven A. Primm, Marnie P. Bookbinder, & George Ledec. 1995. A conservation assessment of the terrestrial ecoregions of Latin America and the Caribbean. The World Bank, Washington, DC.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

Iremonger, S., C.Ravilious, & T.Quinton (eds). 1997. A global overview of forest conservation. CD-ROM. World Conservation Monitoring Centre (WCMC) & Center for International Forestry Research (CIFOR), Cambridge, England.

IUCN World Commission on Protected Areas & World Conservation Monitoring Centre. 1998. United Nations list of protected areas 1997. IUCN–The World Conservation Union, Gland, Switzerland, & World Conservation Monitoring Centre, Cambridge.

Ricketts, Taylor, Eric Dinerstein, David Olson, Colby Loucks, William Eichbaum, Kevin Kavanagh, Prashant Hedao, Patrick Hurley, Karen Carney, Robin Abell, & Steven Walters. 1998. A conservation assessment of the terrestrial ecoregions of North America. Volume I - the United States and Canada (prepublication draft). World Wildlife Fund, Washington, DC.

World Conservation Monitoring Centre. 1997. Biodiversity conservation in the tropics: gaps in habitat protection and funding priorities. WCMC Biodiversity Series 6. World Conservation Monitoring Centre, Cambridge, England.

Methodology Land protection is the average of two weighted indicators [weights in brackets]:

Protected area size (Size score) [2]: protected area as % of total area, weighted for size.

Protected area diversity (Div score) [1]: protected area as % of total area, weighted for diversity.

Protected area diversity was given a lower weight than protected area size because the data are less reliable.

The protected area size indicator measures how much of a country's land and inland water area is protected, weighted according to degree of protection and size of the protected areas. All data are in thousand hectares (000 ha), and all percentages are in terms of total (land + inland water) area. Data are for 1997 and are from the United Nations list of protected areas 1997 (IUCN World Commission on Protected Areas & World Conservation Monitoring Centre 1998). Marine protected areas were excluded because information on them is weak and incomplete.

As defined by IUCN - World Conservation Union, totally protected areas are maintained in a natural state and are closed to extractive uses. Partially protected areas are managed for specific uses (e.g., recreation) or to provide optimum conditions for certain species or ecological communities. Totally protected areas are more likely to protect a wide range of natural ecological communities. For such communities to persist and evolve "naturally," buffered as far as possible against human activities, the areas need to be large. The bigger the area, the more protective it will be (Reid & Miller 1989).

Indicator LPCT **Collection** Wellbeing of Nations

Indicator # 340 **Sub-Index**

Indicator Name Percentage of Cultivated and Modified Land Area with Light Soil Degradation

Units Percentage

Reference Year 1990

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 13.

Original Sources:

Oldeman, L.R. 1993. An international methodology for an assessment of soil degradation and georeferenced soils and terrain database. International Soil Reference and Information Centre, Wageningen, Netherlands.

Oldeman, L.R., R.T.A.Hakkeling, & W.G.Sombroek. 1991. World map of the status of human-induced soil degradation: an explanatory note. 2nd revised edition. International Soil Reference and Information Centre, Wageningen (Netherlands), & United Nations Environment Programme, Nairobi.

Van Lynden, G.W.J., & L.R.Oldeman. 1997. The assessment of the status of human-induced soil degradation in South and Southeast Asia. United Nations Environment Programme, Food and Agricultural Organization of the United Nations, & International Soil Reference and Information Centre, Nairobi, Rome, & Wageningen (Netherlands).

UNEP/ISRIC. 1990. World map on status of human-induced soil degradation. United Nations Environment Programme, Nairobi.

Methodology LPCT is a percentage of land with somewhat reduced agricultural suitability, where the light degree explains the level of soil degradation affecting an area given the weighted total percentage "by the factors given; restoration to full productivity possible by modifying management; original biotic functions still largely intact"

Indicator MPCT **Collection** Wellbeing of Nations

Indicator # 341 **Sub-Index**

Indicator Name Percentage of Cultivated and Modified Land Area with Moderate Soil Degradation

Units Percentage

Reference Year 1990

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 13.

Original Sources:

Oldeman, L.R. 1993. An international methodology for an assessment of soil degradation and georeferenced soils and terrain database. International Soil Reference and Information Centre, Wageningen, Netherlands.

Oldeman, L.R., R.T.A.Hakkeling, & W.G.Sombroek. 1991. World map of the status of human-induced soil degradation: an explanatory note. 2nd revised edition. International Soil Reference and Information Centre, Wageningen (Netherlands), & United Nations Environment Programme, Nairobi.

Van Lynden, G.W.J., & L.R.Oldeman. 1997. The assessment of the status of human-induced soil degradation in South and Southeast Asia. United Nations Environment Programme, Food and Agricultural Organization of the United Nations, & International Soil Reference and Information Centre, Nairobi, Rome, & Wageningen (Netherlands).

UNEP/ISRIC. 1990. World map on status of human-induced soil degradation. United Nations Environment Programme, Nairobi.

Methodology MPCT is a percentage of land with greatly reduced agricultural suitability; major improvements required to restore productivity; original biotic functions are partly destroyed.

Indicator SPCT **Collection** Wellbeing of Nations

Indicator # 342 **Sub-Index**

Indicator Name Percentage of Cultivated and Modified Land Area with Strong Soil Degradation

Units Percentage

Reference Year 1990

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 13.

Original Sources:

Oldeman, L.R. 1993. An international methodology for an assessment of soil degradation and georeferenced soils and terrain database. International Soil Reference and Information Centre, Wageningen, Netherlands.

Oldeman, L.R., R.T.A.Hakkeling, & W.G.Sombroek. 1991. World map of the status of human-induced soil degradation: an explanatory note. 2nd revised edition. International Soil Reference and Information Centre, Wageningen (Netherlands), & United Nations Environment Programme, Nairobi.

Van Lynden, G.W.J., & L.R.Oldeman. 1997. The assessment of the status of human-induced soil degradation in South and Southeast Asia. United Nations Environment Programme, Food and Agricultural Organization of the United Nations, & International Soil Reference and Information Centre, Nairobi, Rome, & Wageningen (Netherlands).

UNEP/ISRIC. 1990. World map on status of human-induced soil degradation. United Nations Environment Programme, Nairobi.

Methodology SPCT is a percentage of land that is "non-reclaimable at farm level; major engineering works required for restoration; original biotic functions destroyed."

Indicator EPCT **Collection** Wellbeing of Nations

Indicator # 343 **Sub-Index**

Indicator Name Percentage of Cultivated and Modified Land Area with Extreme Soil Degradation

Units Percentage

Reference Year 1990

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 13.

Original Sources:

Oldeman, L.R. 1993. An international methodology for an assessment of soil degradation and georeferenced soils and terrain database. International Soil Reference and Information Centre, Wageningen, Netherlands.

Oldeman, L.R., R.T.A.Hakkeling, & W.G.Sombroek. 1991. World map of the status of human-induced soil degradation: an explanatory note. 2nd revised edition. International Soil Reference and Information Centre, Wageningen (Netherlands), & United Nations Environment Programme, Nairobi.

Van Lynden, G.W.J., & L.R.Oldeman. 1997. The assessment of the status of human-induced soil degradation in South and Southeast Asia. United Nations Environment Programme, Food and Agricultural Organization of the United Nations, & International Soil Reference and Information Centre, Nairobi, Rome, & Wageningen (Netherlands).

UNEP/ISRIC. 1990. World map on status of human-induced soil degradation. United Nations Environment Programme, Nairobi.

Methodology EPCT is a percentage of land that is unreclaimable and beyond restoration; original biotic functions fully destroyed.

Indicator GGSC **Collection** Wellbeing of Nations

Indicator # 344 **Sub-Index**

Indicator Name Greenhouse Gas Score

Units kilograms of carbon per person

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.

Original Sources:

Corner House, The. 1997. Climate and equity after Kyoto. Briefing 3. The Corner House, Sturminster Newton, England.

Marland, Gregg, Tom Boden, & Robert J. Andres. 2000. National CO2 emissions from fossil-fuel burning, cement manufacture, and gas flaring 1751-1997. September 6, 2000. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

United Nations Population Division. 1998c. World population projections to 2150. United Nations, New York.

Methodology

GGSC is the score for carbon dioxide emissions per person. The top of the fair band matches the point below which carbon emissions per person must fall to keep atmospheric concentrations at less than double the pre-industrial level. Dangerous climate change could occur above this level (Corner House 1997). To stay below it, global emissions would have to be cut from 6.6 billion metric tons of carbon in 1997 to between 3.7 and 4.9 billion metric tons. If the intermediate amount of 4.3 billion were shared equally by the world population of 10.8 billion projected for 2050 (UN's medium variant projection [United Nations Population Division 1998c]), each person would have an emissions allowance of just under 400 kilograms.

Summary of country performance:

79	Good	44%
20	Fair	11%
29	Medium	16%
34	Poor	19%
15	Bad	8%
3	No Data	2%

Indicator ODSMT **Collection** Wellbeing of Nations

Indicator # 345 **Sub-Index**

Indicator Name Annual Use of Ozone Depleting Substances

Units Metric tons of ozone depleting potential

Reference Year 1995

Source

Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.

Original Sources:

Ozone Secretariat, United Nations Environment Programme. 1997. Production and consumption of ozone depleting substances 1986-1995. Ozone Secretariat, UNEP, Nairobi.

Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.

Methodology

ODSMTis the annual use of ozone depleting substances (ODS) in metric tons of ozone depleting potential (mt odp). ODS include chlorofluorocarbons (CFCs), halons, other fully halogenated CFCs, carbon tetrachloride, methyl chloroform, HCFCs, and methyl bromide. These substances are used in automobile and truck air conditioning units, domestic and commercial refrigeration and air conditioning/heat pump equipment, aerosol products, portable fire extinguishers, pre-polymers, and insulation boards, panels and pipe covers (Ozone Secretariat, United Nations Environment Programme 1997). Data are from Ozone Secretariat, United Nations Environment Programme (1999) and United Nations Environment Programme (1998).

"The protective stratosphereic zone is being weakened by these gases, known as ODS. One of the most common of these is the CFCs or chlorofluorocarbons, a gas that is used in air conditioners, refridgerators and plastics among other things."

Indicator	ODPHA	**Collection**	Wellbeing of Nations
Indicator #	346	**Sub-Index**	
Indicator Name	Use of Ozone Depleting Substances per Land Area		
Units	use of ozone depleting substances per hectare of total (land and inland waters) area in grams of ozone depleting potential		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17. Original Sources: Ozone Secretariat, United Nations Environment Programme. 1997. Production and consumption of ozone depleting substances 1986-1995. Ozone Secretariat, UNEP, Nairobi. Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.		
Methodology	ODPHAG refers to the use of ozone depleting substances per hectare of total (land and inland waters) area in grams of ozone depleting potential (g odp).		

Indicator	ODPPG	**Collection**	Wellbeing of Nations
Indicator #	347	**Sub-Index**	
Indicator Name	Use of Ozone Depleting Substances Per Capita		
Units	he use of ozone depleting substances per person in grams of ozone depleting potential.		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17. Original Sources: Ozone Secretariat, United Nations Environment Programme. 1997. Production and consumption of ozone depleting substances 1986-1995. Ozone Secretariat, UNEP, Nairobi. Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.		
Methodology	ODPPG refers to the use of ozone depleting substances per person in grams of ozone depleting potential (g odp).		

Indicator	ODSSC	**Collection**	Wellbeing of Nations
Indicator #	348	**Sub-Index**	
Indicator Name	Ozone Depleting Substances Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	2001		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 17.		

Original Sources:

Ozone Secretariat, United Nations Environment Programme. 1997. Production and consumption of ozone depleting substances 1986-1995. Ozone Secretariat, UNEP, Nairobi.

Ozone Secretariat, United Nations Environment Programme. 1999. Production and consumption of ozone depleting substances 1986-1998. Ozone Secretariat, UNEP, Nairobi.

Methodology ODSSC is the score for use of ozone depleting substances per person. The top of the good band (zero consumption/production) corresponds to international agreements to eliminate ODS. When measuring ozone depleting substance use, the higher of the two "uses" is utilized (production or consumption).

Summary of country performance:

67	Good	37%
27	Fair	15%
28	Medium	16%
17	Poor	9%
15	Bad	8%
26	No Data	14%

Indicator MAMTOT **Collection** Wellbeing of Nations

Indicator # 349 **Sub-Index**

Indicator Name Total Native Species of Mammals

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology Total mammals, excluding oceanic mammals. "Total" means total native species. Data are from the UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b).

Indicator MAMTHR **Collection** Wellbeing of Nations

Indicator # 350 **Sub-Index**

Indicator Name Threatened Mammals

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology MAMTHR refers to mammals that are threatened. The definition of a good percentage of threatened species (below 2%) is based the estimated natural rate of extinction of less than 0.01% per century.

"Total" means total native species. Data are from the UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b).

Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994).

Indicator MAMPCT **Collection** Wellbeing of Nations

Indicator # 351 **Sub-Index**

Indicator Name Threatened Native Species as a Percentage of Total Native Mammal Species

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology MAMPCT is threatened native species of mammals as a percentage of total native species.

Indicator BRDTOT **Collection** Wellbeing of Nations

Indicator # 352 **Sub-Index**

Indicator Name Total Native Species of Brids

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology BRDTOT includes the birds total native species present. Birds include only species that breed in the
country concerned, because of widely differing standards in recording vagrants, accidentals, and irregular migrants. The number of breeding bird species in Bolivia was extrapolated from the number of total bird species.

Total = total native species. Data are from the UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b).

Indicator BRDTHR **Collection** Wellbeing of Nations

Indicator # 353 **Sub-Index**

Indicator Name Threatened Birds

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

Methodology BRDTHR refers to birds that are threatened. Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994).

Indicator BRDPCT **Collection** Wellbeing of Nations

Indicator # 354 **Sub-Index**

Indicator Name Threatened Native Bird Species as a Percentage of Total Native Species

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology BRTPCT is threatened native species of birds as a percentage of total native species.

Indicator RPTTOT **Collection** Wellbeing of Nations

Indicator # 355 **Sub-Index**

Indicator Name Total Native Reptile Species

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology RPTTOT includes the total repitiles species present. Total = total native species. Data are from the UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b).

Indicator RPTTHR **Collection** Wellbeing of Nations

Indicator # 356 **Sub-Index**

Indicator Name Threatened Reptiles

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology RPTTHR refers to the number of threatened reptiles, for that given country. Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994).

Indicator RPTPCT **Collection** Wellbeing of Nations

Indicator # 357 **Sub-Index**

Indicator Name Threatened Native Reptiles as a Percentage of Total Native Reptile Species

Units percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology RPTPCT is threatened native species of reptiles as a percentage of total native species.

Indicator AMTOT **Collection** Wellbeing of Nations

Indicator # 358 **Sub-Index**

Indicator Name Total Native Amphibian Species

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology The wild animal species indicator covers four higher animal classes. AMTOT includes the total amphibians species present. Total = total native species. Data are from the UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b).

Indicator AMTHR **Collection** Wellbeing of Nations

Indicator # 359 **Sub-Index**

Indicator Name Threatened Amphibians

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology AMTHR refers to the number of threatened amphibians, for that given country. Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994).

Indicator AMPCT **Collection** Wellbeing of Nations

Indicator # 360 **Sub-Index**

Indicator Name Threatened Native Amphibians as a Percentage of Total Native Amphibian Species

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology AMPCT is threatened native species of amphibians as a percentage of total native species.

Indicator MBPCT **Collection** Wellbeing of Nations

Indicator # 361 **Sub-Index**

Indicator Name Average Percentage of Mammals and Birds Threatened

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species.

IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology MBPCT is the average percentage of native mammal and bird species threatened.

Indicator MBRAPCT **Collection** Wellbeing of Nations

Indicator # 362 **Sub-Index**

Indicator Name Average Percentage of Mammals, Birds, Reptiles and Amphibians Threatened

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology MBRAPCT is the average percentage of native mammal, bird, reptile and amphibian species threatened

Indicator CLASCOV **Collection** Wellbeing of Nations

Indicator # 363 **Sub-Index**

Indicator Name Number of Classes For Which Species Threat Data Are Available

Units Number of species classes

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology CLASCOV is the number of classes covered. If all four classes are covered, then the indicator for that country is complete. If fewer than four are covered, then the result may be due to the lack of data. If the class does not exist in the country (for example, reptiles in Iceland), it is included in the number in brackets but is not counted in the calculation of the average percentage.

Indicator WASSC **Collection** Wellbeing of Nations

Indicator # 364 **Sub-Index**

Indicator Name Wild Animal Species Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology WASSC is the wild animal species score. This is based on either the average percentage of mammals and birds or the average percentage of mammals, birds, reptiles and amphibians, whichever gives the lower score. The mammal and bird data are more reliable than the data on reptiles and amphibians, and ideally the indicator would be based on these two classes alone. However, the reptile and amphibian data are no worse than the plant data, and excluding them would give misleadingly high scores to several countries, such as Barbados and Turkey. Scores are based on mammals and birds alone in 160 countries, and on the four classes in 23 countries (11 in the Americas, 2 in Africa, 4 in Europe, 6 in Asia). Mammals exclude ocean-dwelling whatles and dolphins because they cannot be assigned to particluar counties.

Summary of country performance:

3	Good	2%
22	Fair	12%
54	Medium	30%
73	Poor	41%
28	Bad	16%

Indicator	BDTHR	**Collection**	Wellbeing of Nations
Indicator #	365	**Sub-Index**	

Indicator Name Ratio of Threatened to Not-At-Risk Breeds of Animal Species

Units Ratio

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Original Sources:

BirdLife International. 2000. Threatened birds of the world. BirdLife International, Cambridge.

IUCN Species Survival Commission. 1994. IUCN Red List Categories. IUCN–World Conservation Union, Gland, Switzerland.

IUCN Species Survival Commission. 2000. The 2000 IUCN Red List of Threatened Species. IUCN–World Conservation Union, Gland, Switzerland.

UNEP World Conservation Monitoring Centre Threatened Animals Database (WCMC 1998b)

World Conservation Monitoring Centre. 1996b & 1998b. World Conservation Monitoring Centre Threatened Animals Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology BDTHR measures the mean threatened breeds to the ratio of threatened to not at risk breeds of animal species, taking the average of the three species chosen for mean breed diversity. Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994).

Indicator	WSPRNK	**Collection**	Wellbeing of Nations
Indicator #	366	**Sub-Index**	

Indicator Name Wild Species Rank

Units Average rank of each of the 180 countries

Reference Year 2001

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology The WSPRNK or wild species rank is the average rank of each of the 180 countries in total numbers of wild native species in seven groups: three plant groups (flowering plants, gymnosperms, pteridophytes); and four animal groups (mammals, breeding birds, reptiles, amphibians). Countries were ranked separately for each group, and the average taken of the ranks. The wild plant species indicator covers wild higher plants in three groups:
Flowering Plants= angiosperms
Gymnosperms = conifers, cycads, and gnetophytes
Pteridophytes = ferns, horsetails, and clubmosses

Indicator	FLPTOT	**Collection**	Wellbeing of Nations
Indicator #	367	**Sub-Index**	
Indicator Name	Total Native Species of Flowering Species		
Units	Number of species		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19. Orignial Sources: World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.		
Methodology	FLPTOT indicates the total native species of flowering plants (angiosperms).		

Indicator	FLPTHR	**Collection**	Wellbeing of Nations
Indicator #	368	**Sub-Index**	
Indicator Name	Threatened Native Species of Flowering Plants		
Units	Number of species		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19. Orignial Sources: World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.		
Methodology	FLPTHR measures threatened native species among flowering plants (angiosperms). Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994). Data are for 1998 and are from the UNEP World Conservation Monitoring Centre Threatened Plants Database (WCMC 1998a).		

Indicator	FLPPCT	**Collection**	Wellbeing of Nations
Indicator #	369	**Sub-Index**	
Indicator Name	Threatened Flowering Plants Species as a Percentage of all Wild Species		
Units	Percentage		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19. Orignial Sources:		

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology FLPPCTmeasures threatened native species as a percentage of total native species among flowering plants (angiosperms).

Indicator GYMTOT **Collection** Wellbeing of Nations

Indicator # 370 **Sub-Index**

Indicator Name Total Gymnosperms

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology GYMTOT indicates the total native species of gymnosperms (conifers, cycads, and gnetophytes).

Indicator GYMTHR **Collection** Wellbeing of Nations

Indicator # 371 **Sub-Index**

Indicator Name Threatened Native Species of Gymnosperms

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology GYMTHR measures threatened native species among Gymnosperms (conifers, cycads, and gnetophytes). Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994). Data are for 1998 and are from the UNEP World Conservation Monitoring Centre Threatened Plants Database (WCMC 1998a).

Indicator GYMPCT **Collection** Wellbeing of Nations

Indicator # 372 **Sub-Index**

Indicator Name Threatened Gymnosperms as a Percentage of Total Native Species of Gymnosperms

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology GYMPCT measures threatened gymnosperms' native species as a percentage of total native species (conifers, cycads, and gnetophytes).

Indicator PTETOT **Collection** Wellbeing of Nations

Indicator # 373 **Sub-Index**

Indicator Name Total Native Species of Pteridophytes

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology PTETOT indicates the total native species of pteridophytes (ferns, horsetails, and clubmosses)

Indicator PTETHR **Collection** Wellbeing of Nations

Indicator # 374 **Sub-Index**

Indicator Name Threatened Native Species of Pteridophytes

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology PTETHR measures threatened native species among pteridophytes (ferns, horsetails, and clubmosses.) Threatened means critically endangered (high risk of extinction in the immediate future), endangered (high risk of extinction in the near future) or vulnerable (high risk of extinction in the medium-term future). Full definitions are in IUCN Species Survival Commission (1994). Data are for 1998 and are from the UNEP World Conservation Monitoring Centre Threatened Plants Database (WCMC 1998a).

Indicator PTEPCT **Collection** Wellbeing of Nations

Indicator # 375 **Sub-Index**

Indicator Name Threatened Native Species of Pteridophytes as a Percentage of Total Native Species

Units percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology PTEPCTmeasures threatened pteridophytes' native species as a percentage of total native species ((ferns, horsetails, and clubmosses).

Indicator PSSC **Collection** Wellbeing of Nations

Indicator # 376 **Sub-Index**

Indicator Name Wild Plant Species Score

Units Percentage

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology The PSSC is the wild plant species score whereby the "score of threatened plant species in a group as a percentage of total species of that group (average percentage of three groups: flowering plants, gymnosperms [conifers, cycads, gnetophytes] and ferns and allies).

Summary of country performance:

2	Good	1%
61	Fair	17%
18	Medium	34%
18	Poor	10%
32	Bad	18%
36	No Data	20%

Details:

The background extinction rate is estimated to be less than 0.01% of species per century (Reid & Miller 1989). It is assumed that the background percentage of threatened species is less than 100 times the extinction rate, or less than 1%. Therefore, the top of the good band was set at 0%, and the top of the fair band at 2%.

"The plant species results are strongly influenced by the distrubution of gymnosperms. Although they never make up more than 2% of the plant species in a country, the percentage of gymnospperms that is threatened is generally high- up to 100%- compared with flowering

plants (up to 51%) and ferns (up to 28%)."

Indicator LMCSC **Collection** Wellbeing of Nations

Indicator # 377 **Sub-Index**

Indicator Name Land Modification and Conversion Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 10.

Other sources:

O'Neill, R.V., C.T.Hunsaker, D.Jones, J.M.Klopatek, V.H.Dale, M.G.Turner, R.H.Gardner, & R.Graham. 1995. Sustainability and landscape and regional scales. In: Munasinghe, Mohan, & Walter Shearer (eds). 1995. Defining and measuring sustainability: the biogeophysical foundations. The United Nations University & the World Bank, Washington, DC.

Methodology The LMCSC represents the average of the following three scores:

1) Forest change score = score for % annual change in native forest area. The performance criteria are shown in Table 10a. The tops of the fair and medium bands have been set so that an increase in forest area gets a good score, a decline of 0.1% or more a medium score or worse, and zero change (stability) a fair score. If the forest area is reported to be exactly the same size at the end of the reporting period as at the beginning (exactly 0.0 change), the score is 80. If there is a decline of less than 0.05%, the score is reduced to 70 - indicated by # (Guyana is the only case).

2) Converstion score = score for converted land as % of total land. The performance criteria are shown in Table 10a. The top of the medium band is based on the landscape pattern theory that habitat becomes dissected into isolated patches below 60% coverage (see Nat score below).

3) Natural land score = score for natural land as % of total land. The performance criteria are shown in Table 10a. Fair performance is defined as better than 60, on the basis of landscape pattern theory, which suggests that if habitat coverage is reduced to less than 59.28% the landscape becomes dissected into isolated patches (O'Neill et al. 1995), which in turn leads to a loss of species.

Indicator SPGNSC **Collection** Wellbeing of Nations

Indicator # 378 **Sub-Index**

Indicator Name Species and Genes Index

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 19.

Orignial Sources:

World Conservation Monitoring Centre. 1998a. World Conservation Monitoring Centre Threatened Plants Database. World Conservation Monitoring Centre, Cambridge, England.

Methodology The species and genes index (S&G index) is the weighted average [weights in brackets] of a wild diversity index (WD score) [2] and a domesticated diversity index (DD score) [1]. Wild diversity has a higher weight because it is measured in terms of species, the extinction of which represents a greater genetic loss than the extinction of breeds and varieties, the measurement units for domesticated diversity. The wild diversity index is the average of two unweighted indicators.

Summary of country performance:

0	Good	0%
19	Fair	11%
89	Medium	49%
60	Poor	33%
12	Bad	7%

Details:

Threatened wild plant species in a group as the percentage of total wild plant species in that group (PS score). .
Threatened wild animal species in a group as the percentage of total wild animal species in that group (AS score).

Indicator HARAR **Collection** Wellbeing of Nations

Indicator # 379 **Sub-Index**

Indicator Name Food Crop Harvested Area

Units Thousands of hectacres

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology HARAR refers to the harvested area (food crops only) in thousands of hectares (000 ha); except Haiti, Liberia, Rwanda, Bosnia & Herzegovina and Afghanistan, which is cropland area in thousands of hectares.

Indicator PRODTON **Collection** Wellbeing of Nations

Indicator # 380 **Sub-Index**

Indicator Name Food Crop Production

Units Thosands of metric tons

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology PRODTON is the food crop production in thousands of metric tons (000 mt).

Indicator FERTTON **Collection** Wellbeing of Nations

Indicator # 381 **Sub-Index**

Indicator Name Fertilizer Use

Units Thousands of metric tons

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FERTTON is the fertilizer use in thousands of metric tons (000 mt). Although the harvested area and production figures refer to the same set of food crops, the fertilizer data apply to non-food crops as well.

Indicator PRODSC **Collection** Wellbeing of Nations

Indicator # 382 **Sub-Index**

Indicator Name Production Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology PRODSC is the score of one of the agricultural productivity indicators: food produced per harvested hectare.

Indicator FERTA **Collection** Wellbeing of Nations

Indicator # 383 **Sub-Index**

Indicator Name Fertilitzer Use per Hectare

Units Metric tons of fertilizer used per 1000 harvested hectares

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FERTA is a measure of the metric tons of fertilizer used per 1000 harvested hectares.

Indicator FERTSC **Collection** Wellbeing of Nations

Indicator # 384 **Sub-Index**

Indicator Name Fertilizer Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FERTSC refers to the score for fertilizer used per 1000 harvested hectares.

Indicator APSC **Collection** Wellbeing of Nations

Indicator # 385 **Sub-Index**

Indicator Name Agricultural Productivity Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology The APSC is the the unweighted average score of food produced per harvested hectare (Production Score) and fertilizer used per 1000 harvested hectares (Fertilizer Score).

Summary of country performance:

0	Good	2%
29	Fair	12%
94	Medium	30%
32	Poor	18%
18	Bad	10%
7	No Data	4%

Indicator	CEREAL	**Collection**	Wellbeing of Nations
Indicator #	386	**Sub-Index**	
Indicator Name	Cereal Production as a Percentage of Supply		
Units	Percentage		
Reference Year	1997		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23. Original Sources: Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	CEREAL represents production of cereals as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.		

Indicator	STARCH	**Collection**	Wellbeing of Nations
Indicator #	387	**Sub-Index**	
Indicator Name	Starchy Roots Production as a Percentage of Supply		
Units	Percentage		
Reference Year	1997		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23. Original Sources: Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	STARCH gives production rate for starches and roots as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.		

Indicator	SUGARS	**Collection**	Wellbeing of Nations
Indicator #	388	**Sub-Index**	
Indicator Name	Sugar Crops Production as a Percentage of Supply		
Units	Percentage		
Reference Year	1997		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23. Original Sources:		

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology SUGARS gives production rate for sugars as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator OILNUTS **Collection** Wellbeing of Nations

Indicator # 389 **Sub-Index**

Indicator Name Oil Crops Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology OILNUTS gives production rate for oils and nuts as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator PULSES **Collection** Wellbeing of Nations

Indicator # 390 **Sub-Index**

Indicator Name Pulses Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology PULSES gives production rate for pulses as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator FRUIT **Collection** Wellbeing of Nations

Indicator # 391 **Sub-Index**

Indicator Name Fruit Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FRUIT gives production rate for fruit as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator MEATS **Collection** Wellbeing of Nations

Indicator # 392 **Sub-Index**

Indicator Name Meats Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology MEATS gives production rate for meats as a percent of supply. Production means total domestic production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator DAIRY **Collection** Wellbeing of Nations

Indicator # 393 **Sub-Index**

Indicator Name Dairy Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology DAIRY gives production rate for dairy as a percent of supply. Production means total domestic

production. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. >100 indicates that production exceeds supply, the balance being exported.

Indicator FPPCT **Collection** Wellbeing of Nations

Indicator # 394 **Sub-Index**

Indicator Name Food Production as a Percentage of Supply

Units Percentage

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FPPCT is the food production as a percentage of supply, the average of the the following eight categories of food: cereals; starchy roots (Stch roots); sugar crops and sweeteners (Sug swtn); oil crops, plant oils and tree nuts (Oils nuts); pulses and vegetables (Pulse veg); fruit; meat, offal, animal fats [except butter, cream, and fish oils] and eggs (Meat eggs); and dairy products [milk, butter, cream, cheese and other milk products] (D'ry). , cereals through dairy products. Greater than 100 is counted as 100.

Indicator ASRSC **Collection** Wellbeing of Nations

Indicator # 395 **Sub-Index**

Indicator Name Agricultrual Self Reliance Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1997

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology ASRSC is the agricultural self-reliance score, the score of food production as percentage of supply.

Indicator FSPCT **Collection** Wellbeing of Nations

Indicator # 396 **Sub-Index**

Indicator Name Fish and Seafood Production as a Percentage of Supply

Units Percentage

Reference Year 1996

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality

of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FSPCT is the fish and seafood production as a percentage of supply. Fish and seafood include seaweeds and fish oils. Production means the domestic catch + aquaculture. Supply means the amount available for consumption, which is production + imports - exports ± stock changes. Data are for 1996 and are from the food balance sheets and commodities database in FAO (1998a).

Indicator FSRSC **Collection** Wellbeing of Nations

Indicator # 397 **Sub-Index**

Indicator Name Fish and Seafood Self Reliance Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 23.

Original Sources:

Food and Agriculture Organization of the United Nations (FAO). 1998a. FAOSTAT database. Food and Agriculture Organization of the United Nations, Rome.

Methodology FSR is the fish and seafood self-reliance score, which is based on fish and seafood production as % of supply. Countries that produce more than 90% of their supply of fish and seafood are in a position to control the stress their consumption puts on fisheries. Those producing 50% or less are not.

Summary of country performance:

82	Good	46%
15	Fair	8%
15	Medium	8%
9	Poor	5%
50	Bad	28%
9	No Data	5%

Indicator SPPTOT **Collection** Wellbeing of Nations

Indicator # 398 **Sub-Index**

Indicator Name Number of Fishery Species that are the Subject of a Major Fishery

Units Number of fisheries

Reference Year 1994

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

FAO Marine Resources Service, Fishery Resources Division. 1997. Review of the state of

world fishery resources: marine fisheries. FAO Fisheries Circular 920. Food and Agriculture Organization of the United Nations, Rome.

Methodology SPPTOT is the number of fishery species or species groups that are the subject of a major fishery, in which the country concerned is one of the main participants. All data are from FAO Marine Resources Service, Fishery Resources Division (1997).

Indicator SPPASS **Collection** Wellbeing of Nations

Indicator # 399 **Sub-Index**

Indicator Name Number of Major Fishery Species that have been Assessed by FAO

Units Number of species

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

FAO Marine Resources Service, Fishery Resources Division. 1997. Review of the state of world fishery resources: marine fisheries. FAO Fisheries Circular 920. Food and Agriculture Organization of the United Nations, Rome.

Methodology SPPASS number of the fishery species included in SPPTOT whose status has been assessed by FAO. All data are from FAO Marine Resources Service, Fishery Resources Division

Indicator ODR **Collection** Wellbeing of Nations

Indicator # 400 **Sub-Index**

Indicator Name Depletion Status of Assessed Fish Species

Units Number of fish species

Reference Year 1994

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

FAO Marine Resources Service, Fishery Resources Division. 1997. Review of the state of world fishery resources: marine fisheries. FAO Fisheries Circular 920. Food and Agriculture Organization of the United Nations, Rome.

Methodology ODR is the number of assessed fishery species estimated to be overexploited (O), depleted (D), or depleted but recovering (R). Overexploited species are being fished at above a level that is believed to be sustainable, with a high risk of stock collapse or depletion. Catches of depleted species are well below historical levels, irrespective of the amount of fishing effort. Catches of recovering species are increasing after a collapse from a previous high. Non-ODR species are classified as underexploited or undeveloped, moderately exploited, or fully exploited.

Underexploited or undeveloped species are believed to have a significant potential for expanded production. Moderately exploited species are believed to have limited potential for expanded production. Fully exploited species are being fished at or close to an optimal yield level, with no room expected for further expansion.

Indicator	ODRPCT	**Collection**	Wellbeing of Nations
Indicator #	401	**Sub-Index**	
Indicator Name	Percentage of Fish Species Overexploited and Depleted		
Units	Percentage		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24. Original sources: FAO Marine Resources Service, Fishery Resources Division. 1997. Review of the state of world fishery resources: marine fisheries. FAO Fisheries Circular 920. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	ODRPCT is the percentage of overexploited species + depleted species + depleted but recovering species as a percentage of assessed species.		

Indicator	SPPSC	**Collection**	Wellbeing of Nations
Indicator #	402	**Sub-Index**	
Indicator Name	Fisheries Protection Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24. Original sources: FAO Marine Resources Service, Fishery Resources Division. 1997. Review of the state of world fishery resources: marine fisheries. FAO Fisheries Circular 920. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	SPPSC is the species score or the score for the variable ODR. The tops of the fair and medium bands were set at five times those for the wild species indicators, since depleted and overexploited species are not necessarily threatened.		

Indicator	SHELFKM	**Collection**	Wellbeing of Nations
Indicator #	403	**Sub-Index**	
Indicator Name	Contintental Shelf area		
Units	Thousands of square kilometers		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24. Original sources:		

FAO Fishery Resources Division. 1996. Personal communication.

Methodology SHELFKM refers to the continental shelf area in thousands of square kilometers. This data is based on estimates by FAO Fishery Resources Division (1996).

Indicator TCAPKM **Collection** Wellbeing of Nations

Indicator # 404 **Sub-Index**

Indicator Name Fishing Fleet Capacity

Units Tons of capacity per square kilometer of fish producing area

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication.

FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Resources Division. 1996. Personal communication.

Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome.

Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.

Methodology TCAPKM refers to the tons of fishing fleet capacity per square kilometer of fish producing area (continental shelf, inland water area or shelf + inland water as appropriate.)

Indicator TCAPKMSC **Collection** Wellbeing of Nations

Indicator # 405 **Sub-Index**

Indicator Name Fish Catching Capacity per Fish Producing Area Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication.

FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Resources Division. 1996. Personal communication.

Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome.

Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.

Methodology TCAPKMSC is the score for weight of fish catching capacity per unit of fish producing area. The higher the tons of fish catching capacity per area, the lower the score.

Indicator MTCATCH **Collection** Wellbeing of Nations

Indicator # 406 **Sub-Index**

Indicator Name Fish Catch in Marine and Inland Waters

Units Metric tons of catch

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication.

FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Resources Division. 1996. Personal communication.

Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome.

Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.

Methodology MTCATCH refers to the metric tons of catch (marine, and inland waters or both, as appropiate)

Indicator	CATCHSC	**Collection**	Wellbeing of Nations
Indicator #	407	**Sub-Index**	
Indicator Name	Tons of Fish Catch per Ton of Fish Catching Capacity		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24. Original sources: Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome. FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication. FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome. FAO Fishery Resources Division. 1996. Personal communication. Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome. Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	CATCHSC refers to the score for weight of catch per unit of fish catching capacity.		

Indicator	BRDDSC	**Collection**	Wellbeing of Nations
Indicator #	410	**Sub-Index**	
Indicator Name	Breed Diversity Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.		
Methodology	BRDDSC is the breed diversity score. The performance criteria are shown in Table 20a in the original report (p. 242). It represents the number of not at risk breeds per million head of a species.		

Indicator THRBRSC **Collection** Wellbeing of Nations

Indicator # 411 **Sub-Index**

Indicator Name Threatened Breeds Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 20.

Methodology The THRBRSC is the mean threatened breeds score. The performance criteria are shown in Table 20a in the original report (p. 242). The tops of the poor, medium and fair bands (0.5, 0.2 and 0.1 threatened breeds per one not at risk breed) correspond to 1 threatened breed per 2, 5 and 10 not at risk breeds respectively.

Indicator FPSC **Collection** Wellbeing of Nations

Indicator # 408 **Sub-Index**

Indicator Name Fishing Pressure Score

Units Unitless scale (0 is the worst possible score and 100 is the best)

Reference Year 1995

Source Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24.

Original sources:

Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication.

FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Resources Division. 1996. Personal communication.

Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome.

Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.

Methodology FPSC refers to the fishing pressure score, the unweighted average of the species (SPPSC), tons per area (TCAPKMSC) and catch scores (CATCHSC).

Indicator	FSHSC	**Collection**	Wellbeing of Nations
Indicator #	409	**Sub-Index**	
Indicator Name	Fish and Seafood Selfreliance Score		
Units	Unitless scale (0 is the worst possible score and 100 is the best)		
Reference Year	1995		
Source	Prescott-Allen, Robert. 2001. The Wellbeing of Nations: A Country-by-Country Index of Quality of Life and the Environment. Washington, DC: Island Press. Table 24. Original sources: Food and Agriculture Organization of the United Nations (FAO). 1998b. FAO yearbook: Fishery statistics, capture production: Vol. 82, 1996. Food and Agriculture Organization of the United Nations, Rome. FAO Fishery Information, Data and Statistics Unit. 1996. Personal communication. FAO Fishery Information, Data and Statistics Unit. 1998. Fishery fleet statistics on diskette. Food and Agriculture Organization of the United Nations, Rome. FAO Fishery Resources Division. 1996. Personal communication. Garcia, S.M., & C.Newton. 1994. Current situation, trends and prospects in world capture fisheries. Paper presented at the Conference on Fisheries Management: Global Trends. Seattle, Washington, USA. 14-16 June 1994. Fisheries Department, Food and Agriculture Organization of the United Nations, Rome. Grainger, R.J.R., & S.M.Garcia. 1996. Chronicles of marine fishery landings (1950-1994). Trend analysis and fisheries potential. FAO Fisheries Technical Paper 359. Food and Agriculture Organization of the United Nations, Rome.		
Methodology	FSHSC refers to the fish and seafood self-reliance score, the score of fish and seafood production as % of supply. Higher degrees of self reliance translate to higher scores.		

Collection 6: 2006 National Footprint Accounts

Indicator	ECOLFOOT	**Collection**	Ecological Footprint
Indicator #	412	**Sub-Index**	
Indicator Name	Total Ecological Footprint		
Units	global hectares per person (hectares normalized to have world average bioproductivity)		
Reference Year	2003		
Source	Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org		
Methodology	The Ecological Footprint measures how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management		

practices. Ecological Footprints are reported in global hectares, hectares normalized to have world average bioproductivity.

The total national Ecological Footprint reports the number of global hectares necessary to support the consumption of the residents of a nation, regardless of where those hectares are located on the planet. The total Ecological Footprint is the sum of seven major Footprint categories or land types - cropland (CROPFOOT), grazing land (GRAZFOOT), fishing grounds (FISHFOOT), forest IFORESTFOOT), carbon (CARBFOOT), nuclear (NUKEFOOT), and built-up land (BILTFOOT).

The National Footprint Accounts, which calculate the Ecological Footprint and biocapacity of 150 nations from 1961-2003, are maintained by Global Footprint Network on behalf of its 80 partner organizations.

Indicator CROPFOOT **Collection** Ecological Footprint

Indicator # 413 **Sub-Index**

Indicator Name Cropland Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology The Cropland Footprint is one of seven major components of the total Ecological Footprint, and represents the total area of harvested and unharvested land planted to food and fibre crops that are necessary to meet the crop product demands of the residents of a nation. Source data are drawn primarily from the UN's FAOSTAT database.

Indicator GRAZFOOT **Collection** Ecological Footprint

Indicator # 414 **Sub-Index**

Indicator Name Grazing Land Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology The Grazing Land Footprint is one of seven major components of the total Ecological Footprint, and represents the total area of grazing land (also known as range land or pasture land) demanded to support the meat and animal product consumption of residents of a nation. Source data are drawn primarily from the UN's FAOSTAT database.

Indicator FORESTFOOT **Collection** Ecological Footprint

Indicator # 415 **Sub-Index**

Indicator Name Forest Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at

www.footprintnetwork.org

Methodology The forest Footprint is one of seven major components of the total Ecological Footprint, and represents the total area of forest land necessary to meet the timber and fuelwood demands of the residents of a nation. Source data are drawn primarily from the UN's FAOSTAT database and Forest Resource Assessment (FRA)..

Indicator FISHFOOT **Collection** Ecological Footprint

Indicator # 416 **Sub-Index**

Indicator Name Fishing Ground Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology The Fishing Grounds Footprint is one of seven major components of the total Ecological Footprint, and represents the total area of marine and inland water area needed to produce all of the aquatic products consumed by the residents of a nation. Data are drawn largely from the UN FAO's Fisheries and Aquaculture Department. In the 2006 Edition of the accounts, the Footprint of aquaculture is not specifically calculated.

Indicator CARBFOOT **Collection** Ecological Footprint

Indicator # 417 **Sub-Index**

Indicator Name Carbon Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology The Carbon Footprint is one of seven major components of the total Ecological Footprint, and represents the total bioproductive area necessary to meet the waste-absorption demands associated with the emission of fossil carbon from all residents of a nation. Currently, the carbon Footprint is calculated as the amount of forest area, expressed in global hectares, necessary to sequester a nation's direct and indirect (through the consumption of carbon-intensive goods produced in other nations) fossil carbon emissions.

The carbon Footprint calculation involves adding data on direct carbon emissions, taken from the International Energy Agency, to estimates of carbon embodied in trade, which is estimated using trade flow data for 600 product categories by the UN Statistics COMTRADE database.

Indicator NUKEFOOT **Collection** Ecological Footprint

Indicator # 418 **Sub-Index**

Indicator Name Nuclear Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at

www.footprintnetwork.org

Methodology The Nuclear Footprint is one of seven major components of the total Ecological Footprint, and represents the total bioproductive area needed to meet the demands for nuclear electricity production of the residents of a nation. Since 2002, the Footprint of one unit of nuclear electricity has been calculated as equivalent to one unit of average fossil fuel electricity. This equivalency method is expected to be revised for the 2008 Edition of the National Footprint Accounts.

Indicator BILTFOOT **Collection** Ecological Footprint

Indicator # 419 **Sub-Index**

Indicator Name Built-up Land Footprint

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology The Built-up Land Footprint is one of seven major components of the total Ecological Footprint, and represents the total area of physical infrastructure (e.g., buildings, roads, etc.) located within a nation, as well as the estimated area inundated for producing hydroelectricity. Built-up areas are converted into global hectares by assuming that these areas occupy formerly productive cropland.

Indicator TOTBIOCAP **Collection** Ecological Footprint

Indicator # 420 **Sub-Index**

Indicator Name Total Biocapacity

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology Biocapacity measures the capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. Similar to Ecological Footprint, biocapacity is reported in global hectares, hectares normalized to have world average bioproductivity.

The total biocapacity of a nation reports the number of global hectares of capacity available for human use within the borders of that nation. Total biocapacity is the sum of five major biocapacity categories or land types - cropland (CROPLAND2), grazing land (GRAZLAND), fishing grounds (FISHGRND), forest (FORLAND), and built-up land (BILTFOOT).

The National Footprint Accounts, which calculate the biocapacity and Ecological Footprint of 150 nations from 1961-2003, are maintained by Global Footprint Network on behalf of its 80 partner organizations.

Indicator CROPLAND2 **Collection** Ecological Footprint

Indicator # 421 **Sub-Index**

Indicator Name Cropland

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology Cropland is one of five major components of total biocapacity, and represents the total area of land planted to food and fibre crops, and areas left fallow due to rotation practices, within a nation. Cropland biocapacity is reported in global hectares.

Indicator GRAZLAND **Collection** Ecological Footprint

Indicator # 422 **Sub-Index**

Indicator Name Grazing Land

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology Grazing land is one of five major components of the total biocapacity, and represents the total area of land available for livestock grazing, including grass and scrub land, within a nation. Grazing land biocapacity is reported in global hectares.

Indicator FORLAND **Collection** Ecological Footprint

Indicator # 423 **Sub-Index**

Indicator Name Forest

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology Forest is one of five major components of the total biocapacity, and represents the total area of forest land located within a nation. Forest area is defined according to the UN FAO Forest Resource Assessmsent. Forest biocapacity is reported in global hectares.

Indicator FISHGRND **Collection** Ecological Footprint

Indicator # 424 **Sub-Index**

Indicator Name Fishing Grounds

Units global hectares per person (hectares normalized to have world average bioproductivity)

Reference Year 2003

Source Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org

Methodology Fishing ground is one of five major components of the total biocapacity, and represents the total area of water, both marine and inland, within a nation. Marine areas are measured according to EEZ areas, and inland water includes lakes, rivers, dams, and all other inland

water bodies. Fishing ground biocapacity is reported in global hectares.

Indicator	ECOLDEF	**Collection**	Ecological Footprint
Indicator #	425	**Sub-Index**	
Indicator Name	Ecological Deficit or Reserve		
Units	global hectares per person (hectares normalized to have world average bioproductivity)		
Reference Year	2003		
Source	Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org		
Methodology	The Ecological Reserve or Deficit of a nation is calculated by subtracting that nation's total Ecological Footprint from its total biocapacity. A positive remainder indicates that, in the aggregate, the nation has the potential to meet its ecological demands from ecosystems located within its own borders (Ecological Reserve). An Ecological Reserve may be set aside for natural ecosystems or used for export to other nations. A negative remainder indicates that, in the aggregate, the nation is either relying on imports of biological capacity from outside of its borders or is overusing its own domestic ecosystems (Ecological Deficit).		

Indicator	BILT	**Collection**	Ecological Footprint
Indicator #	426	**Sub-Index**	
Indicator Name	Built-up Land		
Units	global hectares per person (hectares normalized to have world average bioproductivity)		
Reference Year	2003		
Source	Global Footprint Network, 2006. National Footprint Accounts, 2006 Edition. Available at www.footprintnetwork.org		
Methodology	Built-up land is one of five major components of the total biocapacity, and represents the total area of physical infrastructure (e.g., buildings, roads, etc.) located within a nation, as well as the estimated area inundated for producing hydroelectricity. Built-up areas are converted into global hectares by assuming that these areas occupy formerly productive cropland.		

Ancillary Data

Indicator	LANDLOCKED	**Collection**	Ancillary Data
Indicator #	427	**Sub-Index**	
Indicator Name	Landlocked Country Dummy Variable		
Units	Dummy variable (1 for landlocked, 0 for not landlocked)		
Reference Year	2006		

Indicator	SIDS	**Collection**	Ancillary Data
Indicator #	428	**Sub-Index**	
Indicator Name	Small Island Developing State		
Units	Dummy variable (1 for SIDS, 0 otherwise)		

Indicator	REGION	**Collection**	Ancillary Data
Indicator #	429	**Sub-Index**	
Indicator Name	Geographic Region		
Units	Text field		
Reference Year			
Source	Kaly, U.L., Pratt, C.R. and Mitchell, J. 2004. The Demonstration Environmental Vulnerability Index (EVI) 2004. SOPAC Technical Report 384, 323 pp.		
Methodology	Geographic regions are broken down as follows: Antartica Asia Central America & Caribbean Europe Middle East & North Africa North America Oceania South America Sub-Saharan Africa		

Indicator	POP90	**Collection**	Ancillary Data
Indicator #	430	**Sub-Index**	
Indicator Name	Population Size		
Units	Population in 1000s		
Reference Year	1990		
Source	United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.		
Methodology	Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.		

Indicator	POP91	**Collection**	Ancillary Data
Indicator #	431	**Sub-Index**	
Indicator Name	Population Size		
Units	Population in 1000s		
Reference Year	1991		

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP92 **Collection** Ancillary Data

Indicator # 432 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1992

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP93 **Collection** Ancillary Data

Indicator # 433 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1993

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP94 **Collection** Ancillary Data

Indicator # 434 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1994

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP95 **Collection** Ancillary Data

Indicator # 435 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1995

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP96 **Collection** Ancillary Data

Indicator # 436 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1996

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP97 **Collection** Ancillary Data

Indicator # 437 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1997

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP98 **Collection** Ancillary Data

Indicator # 438 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1998

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP99 **Collection**

Indicator # 439 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 1999

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP00 **Collection** Ancillary Data

Indicator # 440 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2000

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP01 **Collection** Ancillary Data

Indicator # 441 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2001

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP02 **Collection** Ancillary Data

Indicator # 442 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2002

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP03 **Collection** Ancillary Data

Indicator # 443 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2003

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP04 **Collection** Ancillary Data

Indicator # 444 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2004

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator POP05 **Collection** Ancillary Data

Indicator # 445 **Sub-Index**

Indicator Name Population Size

Units Population in 1000s

Reference Year 2005

Source United Nations Population Division. 2005. World Population Prospects: The 2004 Revision. File 1: Total Population (Both Sexes Combined) by Major Area, Region and Country, Estimates for 1950-2050 (in thousands), POP/DB/WPP/Rev.2004/2/F1.

Methodology Total population estimate, both sexes combined, in thousands, as of 1 July of the reference year.

Indicator	GDP90	**Collection**	Ancillary Data
Indicator #	446	**Sub-Index**	
Indicator Name	GDP in 2000 US Dollars		
Units	Millions of US Dollars (constant 2000 US$)		
Reference Year	1990		
Source	World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)		

Methodology

Gross domestic product (GDP) measures the total output of goods and services for final use occurring within the domestic territory of a given country, regardless of the allocation to domestic and foreign claims. Gross domestic product at purchaser values (market prices) is the sum of gross value added by all resident and nonresident producers in the economy plus any taxes and minus any subsidies not included in the value of the products. The gross domestic product estimates at purchaser values (market prices) are in constant 2000 U.S. dollars and are the sum of GDP at purchaser values (value added in the agriculture, industry, and services sectors) and indirect taxes, less subsidies. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs. The industrial origin of value added is determined by the International Standard Industrial Classification (ISIC) revision 3.

To obtain comparable series of constant price data, the World Bank rescales GDP and value added by industrial origin to a common reference year, currently 2000. This process gives rise to a discrepancy between the rescaled GDP and the sum of the rescaled components. Because allocating the discrepancy would give rise to distortions in the growth rates, the discrepancy is left unallocated. As a result, the weighted average of the growth rates of the components generally will not equal the GDP growth rate.

National accounts indicators for most developing countries are collected from national statistical organizations and central banks by visiting and resident World Bank missions. The data for high-income economies come from OECD data files. The United Nations Statistics Division publishes detailed national accounts for United Nations member countries in National Accounts Statistics: Main Aggregates and Detailed Tables and updates in the Monthly Bulletin of Statistics

Data Reliability: The World Bank produces the most reliable global GDP estimates available. However, it should be noted that these data do not account for differences in purchasing power (to see national accounts data without these differences, see PPP (purchasing power parity) estimates).

Informal economic activities sometimes pose a measurement problem, especially in developing countries, where much economic activity may go unrecorded. Obtaining a complete picture of the economy requires estimating household outputs produced for local sale and home use, barter exchanges, and illicit or deliberately unreported activity. Technical improvements and growth in services sector are both particularly difficult to measure. The consistency and completeness of such estimates depends on the skill and compilation methods of the compiling statisticians and the resources available to them.

[Adapted from World Bank World Development Indicators online.]

Indicator	GDP91	**Collection**	Ancillary Data
Indicator #	447	**Sub-Index**	
Indicator Name	GDP in 2000 US Dollars		
Units	Millions of US Dollars (constant 2000 US$)		

Reference Year 1991

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP92 **Collection** Ancillary Data

Indicator # 448 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1992

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP93 **Collection** Ancillary Data

Indicator # 449 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1993

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP94 **Collection** Ancillary Data

Indicator # 450 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1994

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP95 **Collection** Ancillary Data

Indicator # 451 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1995

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP96 **Collection** Ancillary Data

Indicator # 452 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1996

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP97 **Collection** Ancillary Data

Indicator # 453 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1997

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP98 **Collection** Ancillary Data

Indicator # 454 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1998

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP99 **Collection** Ancillary Data

Indicator # 455 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 1999

Source World Bank Development Data Group. 2006. World Development Indicators Database.

http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP00 **Collection** Ancillary Data

Indicator # 456 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 2000

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP01 **Collection** Ancillary Data

Indicator # 457 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 2001

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP02 **Collection** Ancillary Data

Indicator # 458 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 2002

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP03 **Collection** Ancillary Data

Indicator # 459 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 2003

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDP04 **Collection** Ancillary Data

Indicator # 460 **Sub-Index**

Indicator Name GDP in 2000 US Dollars

Units Millions of US Dollars (constant 2000 US$)

Reference Year 2004

Source World Bank Development Data Group. 2006. World Development Indicators Database. http://devdata.worldbank.org/dataonline/ (downloaded 6 March 2006)

Methodology See methodology for the variable GDP90.

Indicator GDPPC05 **Collection** Ancillary Data

Indicator # 461 **Sub-Index**

Indicator Name GDP Per Capita

Units US Dollars

Reference Year 2005 (most countries)

Source Central Intelligence Agency (CIA). 2005. CIA World Factbook. http://www.cia.gov/cia/publications/factbook/rankorder/2004rank.html (Downloaded 3 March 2006)

Methodology Gross domestic product (GDP) measures the total output of goods and services for final use occurring within the domestic territory of a given country, regardless of the allocation to domestic and foreign claims. For more details on the methodology used to caclulate it, see indicators GDP90-GDP04. GDP per capita represents the total GDP divided by national population.

Data represent 2005 estimates for all countries except the following: 1993 (Tokelau), 1998 (Saint Helena), 1999 (Liechtenstein), 2000 (American Samoa, Gibraltar
Guam, Monaco, Niue, Northern Mariana Islands, Tuvalu), 2001 (Cook Islands, Faroe Islands, Greenland
Kiribati, Marshall Islands, Nauru, Palau, Saint Pierre and Miquelon, San Marino), 2002 (Anguilla, Antigua and Barbuda, Aruba, Djibouti, Falkland Islands, Grenada, Maldives, Micronesia, Montserrat, Saint Kitts and Nevis,
Saint Lucia, Saint Vincent and the Grenadines, Samoa
Seychelles, Solomon Islands, Tonga, Turks and Caicos Islands, Virgin Islands), 2003 (Macau, Andorra, Bermuda, Bhutan, Brunei, Dominica, French Guiana, French Polynesia, Gaza Strip, Guadeloupe, Martinique, Mayotte, Netherlands Antilles, New Caledonia, Sao Tome and Principe, Vanuatu, West Bank), and 2004 (Afghanistan, British Virgin Islands, Cayman Islands, East Timor, Wallis and Futuna).

Indicator LANDAREA **Collection** Ancillary Data

Indicator # 462 **Sub-Index**

Indicator Name Land Area (not including large water bodies and permanent ice)

Units Square Kilometers

Reference Year 2005

Source Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World Version 3 (GPWv3). Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw.

Methodology LANDAREA reflects land area only - that is land area net of permanent ice and large water bodies. Large waterbodies are those that are greater than 15 square km as identifed in the Digital Chart of the World.

Indicator WATICEAREA **Collection** Ancillary Data

Indicator # 463 **Sub-Index**

Indicator Name Area of Large Waterbodies and Permanent Ice

Units Square Kilometers

Reference Year 2005

Source Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World Version 3 (GPWv3). Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw.

Methodology Large waterbodies are those that are greater than 15 square km as identifed in the Digital Chart of the World. Smaller waterbodies are not included.

Indicator TOTALAREA **Collection** Ancillary Data

Indicator # 464 **Sub-Index**

Indicator Name Total Land Area (including large water bodies and permanent ice)

Units Square Kilometers

Reference Year 2005

Source Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World Version 3 (GPWv3). Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw.

Methodology LANDAREA reflects the total territory of the country, including land, large waterbodies, and area under permanent ice. Large waterbodies are those that are greater than 15 square km as identifed in the Digital Chart of the World.