

## Appendix A: Structure of the Sustainable Competitiveness Index (cont'd.)

### Financial market development

#### A. Efficiency

- G8.01 Availability of financial services
- G8.02 Affordability of financial services
- G8.03 Financing through local equity market
- G8.04 Ease of access to loans
- G8.05 Venture capital availability
- G8.06 Restriction on capital flows

#### A. Trustworthiness and confidence

- G8.07 Soundness of banks
- G8.08 Regulation of securities exchanges
- G8.09 Legal rights index\*

### Market size

#### A. Domestic market size

- G10.01 Domestic market size index\*<sup>h</sup>

#### B. Foreign market size

- G10.02 Foreign market size index\*<sup>i</sup>

### Goods market efficiency

#### A. Competition<sup>e</sup>

##### 1. Domestic competition<sup>e</sup>

- G6.01 Intensity of local competition
- G6.02 Extent of market dominance
- G6.03 Effectiveness of anti-monopoly policy
- G6.04 Extent and effect of taxation
- G6.05 Total tax rate\*
- G6.06 Number of procedures required to start a business\*<sup>f</sup>
- G6.07 Time required to start a business\*<sup>f</sup>
- G6.08 Agricultural policy costs

##### 2. Foreign competition

- G6.09 Prevalence of trade barriers
- G6.10 Trade tariffs\*
- G6.11 Prevalence of foreign ownership
- G6.12 Business impact of rules on FDI
- G6.13 Burden of customs procedures
- G6.14 Imports as a percentage of GDP\*<sup>g</sup>

#### B. Quality of demand conditions

- G6.15 Degree of customer orientation
- G6.16 Buyer sophistication

### Business sophistication

- G11.01 Local supplier quantity
- G11.02 Local supplier quality
- G11.03 State of cluster development
- G11.04 Nature of competitive advantage
- G11.05 Value chain breadth
- G11.06 Control of international distribution
- G11.07 Production process sophistication
- G11.08 Extent of marketing
- G11.09 Willingness to delegate authority
- G7.07 Reliance on professional management<sup>½</sup>

### Innovation

- G12.01 Capacity for innovation
- G12.02 Quality of scientific research institutions
- G12.03 Company spending on R&D
- G12.04 University-industry collaboration in R&D
- G12.05 Government procurement of advanced technology products
- G12.06 Availability of scientists and engineers
- G12.07 Utility patents\*
- G1.02 Intellectual property protection<sup>½</sup>

## POLICY ENVIRONMENT AND ENABLING CONDITIONS

### Institutions

#### A. Public institutions

##### 1. Property rights

- G1.01 Property rights
- G1.02 Intellectual property protection<sup>½</sup>

##### 2. Ethics and corruption

- G1.03 Diversion of public funds
- G1.04 Public trust of politicians
- G1.05 Irregular payments and bribes

##### 3. Undue influence

- G1.06 Judicial independence
- G1.07 Favoritism in decisions of government officials

##### 4. Government inefficiency

- G1.08 Wastefulness of government spending
- G1.09 Burden of government regulation
- G1.10 Efficiency of legal framework in settling disputes
- G1.11 Efficiency of legal framework in challenging regulations
- G1.12 Transparency of government policymaking

##### 5. Security

- G1.13 Business costs of terrorism
- G1.14 Business costs of crime and violence
- G1.15 Organized crime
- G1.16 Reliability of police services

#### B. Private institutions

##### 1. Corporate ethics

- G1.17 Ethical behavior of firms

##### 2. Accountability

- G1.18 Strength of auditing and reporting standards
- G1.19 Efficacy of corporate boards
- G1.20 Protection of minority shareholders' interests
- G1.21 Strength of investor protection\*

## TECHNOLOGY AND INNOVATION

### Technological readiness

#### A. Technological adoption

- G9.01 Availability of latest technologies
- G9.02 Firm-level technology absorption
- G9.03 FDI and technology transfer

#### B. ICT use

- G9.04 Internet users\*
- G9.05 Broadband Internet subscriptions\*
- G9.06 Internet bandwidth\*
- G2.08 Fixed telephone lines\*<sup>½</sup>
- G2.09 Mobile telephone subscriptions\*<sup>½</sup>

## Appendix A: Structure of the Sustainable Competitiveness Index (cont'd.)

### Infrastructure

#### A. Transport infrastructure

- G2.01 Quality of overall infrastructure
- G2.02 Quality of roads
- G2.03 Quality of railroad infrastructure
- G2.04 Quality of port infrastructure
- G2.05 Quality of air transport infrastructure
- G2.06 Available seat kilometers\*

#### B. Energy and telephony infrastructure

- G2.07 Quality of electricity supply
- G2.08 Fixed telephone lines\*<sup>½</sup>
- G2.09 Mobile telephone subscriptions\*<sup>½</sup>

### Macroeconomic environment<sup>j</sup>

- G3.02 National savings rate\*
- G3.04 Interest rate spread\*
- G3.05 Government debt\*
- G3.06 Country credit rating\*
- S07 Government budget balance (5-year average)\*

### Environmental policy

- S08 Stringency of environmental regulation
- S09 Enforcement of environmental regulation
- S10 Eco-region protection\*
- S11 No. of ratified international environmental treaties\*

## PHYSICAL ENVIRONMENT

### Resource efficiency

- S12 Energy intensity\*
- S13 Agricultural water intensity\*
- S14 CO<sub>2</sub> intensity\*

### Management of renewable resources

- S15 Access to improved drinking water\*
- S16 Marine trophic intensity\*
- S17 Forest cover change\*

### Environmental degradation

- S18 Air pollution\*
- S19 Water stress index\*

## NOTES

a Formally, for a category  $i$  composed of  $K$  indicators, we have:

$$category_i = \frac{\sum_{k=1}^K indicator_k}{K}$$

b Formally, we have:

$$6 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 1$$

The *sample minimum* and *sample maximum* are, respectively, the lowest and highest country scores in the sample of economies covered by the GCI. In some instances, adjustments were made to account for extreme outliers. For those indicators for which a higher value indicates a worse outcome (e.g., disease incidence, government debt), the transformation formula takes the following form, thus ensuring that 1 and 7 still corresponds to the worst and best possible outcomes, respectively:

$$-6 \times \frac{(\text{country score} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 7$$

- c Variables S01 and S02 combine to form one single variable.
- d The impact of malaria, tuberculosis, and HIV/AIDS on competitiveness depends not only on their respective incidence rates but also on how costly they are for business. Therefore, in order to estimate the impact of each of the three diseases, we combine its incidence rate with the Survey question on its perceived cost to businesses. To combine these data we first take the ratio of each country's disease incidence rate relative to the highest incidence rate in the whole sample. The inverse of this ratio is then multiplied by each country's score on the related Survey question. This product is then normalized to a 1-to-7 scale. Note that countries with zero reported incidence receive a 7, regardless of their scores on the related Survey question.
- e The *competition* subpillar is the weighted average of two components: *domestic competition* and *foreign competition*. In both components, the included variables provide an indication of the extent to which competition is distorted. The relative importance of these distortions depends on the relative size of domestic versus foreign competition. This interaction between the domestic market and the foreign market is captured by the way we determine the weights of the two components. Domestic competition is the sum of consumption (C), investment (I), government spending (G), and exports (X), while foreign competition is equal to imports (M). Thus we assign a weight of  $(C + I + G + X)/(C + I + G + X + M)$  to *domestic competition* and a weight of  $M/(C + I + G + X + M)$  to *foreign competition*.
- f Variables G6.06 and G6.07 combine to form one single variable.
- g For variable G6.14, imports as a percentage of GDP, we first apply a log-transformation and then a min-max transformation. This indicator was formerly numbered G10.04. It still enters the computation of the market size indexes (see note j).
- h The size of the domestic market is constructed by taking the natural log of the sum of the gross domestic product valued at purchased power parity (PPP) plus the total value (PPP estimates) of imports of goods and services, minus the total value (PPP estimates) of exports of goods and services. Data are then normalized on a 1-to-7 scale. PPP estimates of imports and exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP. The underlying data are reported in the data tables section.
- i The size of the foreign market is estimated as the natural log of the total value (PPP estimates) of exports of goods and services, normalized on a 1-to-7 scale. PPP estimates of exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP. The underlying data are reported in the data tables.
- j Unlike the macroeconomic environment pillar in the GCI, we have removed the inflation rate and we have replaced the annual government budget deficit with a five-year average.

## Appendix B: Technical notes and sources for the Sustainable Competitiveness Index variables

This appendix presents the technical descriptions and sources for the additional 19 variables that are specific to the Sustainable Competitiveness Index (SCI). These variables are identified by an “S” before the variable number. They appear here in order, from S01 through S19. The numbering indicates only the order of these variables in the structure, but not the pillar to which they belong.

The descriptions and sources for the variables common to the GCI are available in the Technical Notes and Sources at the end of the *Report*.

### S01 Gross secondary enrollment rate, males

#### Gross secondary enrollment rate, males | 2009

The reported value corresponds to the ratio of total secondary enrollment among boys, regardless of age, to the male population of the age group that officially corresponds to the secondary education level. Secondary education (ISCED levels 2 and 3) completes the provision of basic education that began at the primary level, and aims to lay the foundations for lifelong learning and human development, by offering more subject- or skills-oriented instruction using more specialized teachers.

Sources: UNESCO *Institute for Statistics* (accessed May 4, 2011); national sources

### S02 Gross secondary enrollment rate, females

#### Gross secondary enrollment rate, females | 2009

The reported value corresponds to the ratio of total secondary enrollment among girls, regardless of age, to the female population of the age group that officially corresponds to the secondary education level. Secondary education (ISCED levels 2 and 3) completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skills-oriented instruction using more specialized teachers.

Sources: UNESCO *Institute for Statistics* (accessed May 4, 2011); national sources

### S03 Expected dependency ratio

#### Number of dependents (people younger than 15 or older than 64) to the working-age population (those aged 15–64) in 2030 | 2010

Source: Authors' calculation based on United Nations *World Population Prospects: The 2010 revision*

### S04 Gini index

#### Measure of income inequality [0 = perfect equality; 1 = perfect inequality] | 2008

This index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

Sources: The World Bank, *World Development Indicators & Global Development Finance Catalog* (April 2011 edition); national sources

### S05 Youth unemployment

#### Unemployment, youth total (percent of total labor force ages 15–24) | 2009

Youth unemployment refers to the share of the labor force ages 15–24 without work but available for and seeking employment.

Sources: The World Bank, *World Development Indicators & Global Development Finance Catalog* (April 2011 edition); the World Bank in turn sources from the International Labour Organization, *Key Indicators of the Labour Market* database; national sources

### S06 Extent of informal economy

#### How much economic activity in your country would you estimate to be undeclared or unregistered? [1 = most economic activity is undeclared or unregistered; 7 = most economic activity is declared or registered] | 2010–11 weighted average

Source: World Economic Forum, Executive Opinion Survey

**S07 Government budget balance (5-year average)**

General government budget balance as a percentage of GDP (average of the 5 latest years) | 2006–10

Government budget balance as a percentage of GDP, calculated as a 5-year average of the difference between general government revenue and general government expenditure.

Source: Authors' calculation based on International Monetary Fund, *World Economic Outlook Database* (April 2011 edition)

**S08 Stringency of environmental regulation**

How would you assess the stringency of your country's environmental regulations? [1 = very lax; 7 = among the world's most stringent] | 2010–11 weighted average

Source: World Economic Forum, Executive Opinion Survey

**S09 Enforcement of environmental regulation**

How would you assess the enforcement of environmental regulations in your country? [1 = very lax; 7 = among the world's most rigorous] | 2010–11 weighted average

Source: World Economic Forum, Executive Opinion Survey

**S10 Eco-region protection**

Terrestrial area and territorial waters protected (in km<sup>2</sup> and as a percentage of terrestrial area and territorial waters up to 12 nautical miles) | 2010

This indicator assesses whether a country is protecting at least 10 percent of all of its biomes (e.g., deserts, forests, grasslands, aquatic area, and tundra). It is designed to capture the comprehensiveness of a government's commitment to habitat preservation and biodiversity protection. The World Wildlife Fund provides the underlying biome data, and the United Nations Environment Programme World Conservation Monitoring Centre provides the underlying data on protected areas.

Sources: IUCN and UNEP-WCMC (2011), *The World Database on Protected Areas (WDPA)*; January 2011

**S11 No. of ratified international environmental treaties**

Total number of ratified environmental treaties | 2010

This provides the total number of ratified environmental treaties. This variable measures the total number of international treaties from a set of 25 for which a state is a participant. A state becomes a "participant" by Ratification, Formal confirmation, Accession, Acceptance, Definitive signature, Approval, Simplified procedure, Consent to be bound, Succession, and Provisional application (which are here grouped under the term *ratification*, for reasons of convenience). The treaties included are: the International Convention for the Regulation of Whaling, 1948 Washington; the International Convention for the Prevention of Pollution of the Sea by Oil, 1954 London, as amended in 1962 and 1969; the Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1971 Ramsar; the Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 Paris; the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 London, Mexico City, Moscow, Washington; the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973 Washington; the International Convention for the Prevention of Pollution from Ships (MARPOL) as modified by the Protocol of 1978, 1978 London; the Convention on the Conservation of Migratory Species of Wild Animals, 1979 Bonn; the United Nations Convention on the Law of the Sea, 1982 Montego Bay; the Convention on the Protection of the Ozone Layer, 1985 Vienna; the Protocol on Substances that Deplete the Ozone Layer, 1987 Montreal; the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989 Basel; the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 London; the United Nations Framework Convention on Climate Change, 1992 New York; the Convention on Biological Diversity, 1992 Rio de Janeiro; the International Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, particularly Africa, 1994 Paris; the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, 1994 New York; the Agreement relating to the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995 New York; the Kyoto Protocol to the United Nations Framework Convention on the Climate Change, Kyoto 1997; the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998 Rotterdam; the Cartagena Protocol of Biosafety to the Convention on Biological Diversity, 2000 Montreal; the Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances, 2000 London; the Stockholm Convention on Persistent Organic Pollutants, 2001 Stockholm; the International Treaty on Plant Genetic Resources for Food and Agriculture, 2001 Rome; and the International Tropical Timber Agreement 206, 1994 Geneva.

Source: The International Union for Conservation of Nature (IUCN) Environmental Law Centre *ELIS Treaty Database*

**S12 Energy intensity**

Energy use (kilotonnes TNT [kt] of oil equivalent) per industry value-added (US\$) | 2008

This indicator is calculated as a ratio between the total energy use (expressed as kt of oil equivalent) to the value-added of the industry sector (expressed as current US\$). *Energy use* refers to the use of primary energy before its transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport. The rationale for dividing the energy use by the industry value-added is to obtain a proxy of energy consumption proportional to industrial activity. This is necessary in order to compare countries characterized by different levels of economic activity.

Sources: Authors' calculation based on The World Bank, *World Development Indicators & Global Development Finance Catalog* (April 2011 edition); national sources

## Appendix B: Technical notes and sources for the Sustainable Competitiveness Index variables (cont'd.)

### S13 Agricultural water intensity

#### Agricultural water withdrawal as a percent of total renewable water resources | 2002

This indicator is calculated as the ratio of (100 × Agricultural water withdrawal) to Total renewable water resources, where Total renewable water resources = (Total surface renewable water + Total renewable groundwater – Overlap between surface water and groundwater). Where available, Total renewable water resources include the percent of desalinated water used for agriculture (Kuwait, Saudi Arabia, the United Arab Emirates, Qatar, Bahrain, and Spain). They also include renewable freshwater resources as well as the potential over-abstraction of renewable groundwater or the withdrawal of fossil groundwater, the use of agricultural drainage water, and desalinated water and treated wastewater. They include water withdrawn for irrigation purposes and for livestock watering, although—depending on the country—this last category sometimes is included in municipal water withdrawal. The value of water withdrawn for irrigation far exceeds the consumptive use of irrigation because of water lost in its distribution from its source to the crops. The term *water requirement ratio* (sometimes also called *irrigation efficiency*) is used to indicate the ratio between the net irrigation water requirements or crop water requirements, which is the volume of water needed to compensate for the deficit between potential evapotranspiration and effective precipitation over the growing period of the crop, and the amount of water withdrawn for irrigation, including the losses. In the specific case of paddy rice irrigation, additional water is needed for flooding to facilitate land preparation and to protect plants. In that case, irrigation water requirements are the sum of rainfall deficit and the water needed to flood paddy fields. At the scheme level, water requirement ratio values can vary from less than 20 percent to more than 95 percent. For livestock watering, the ratio between net consumptive use and water withdrawn is estimated to be between 60 and 90 percent. By default, livestock water use is accounted for in agricultural water use, although some countries include it in municipal water withdrawal.

Sources: Environmental Performance Index (EPI), Yale University; Food and Agricultural Organization of the United Nations (FAO), Aquastat

### S14 CO<sub>2</sub> intensity

#### CO<sub>2</sub> intensity (kg of CO<sub>2</sub> per kg of oil equivalent energy use) | 2007

Carbon dioxide emissions from solid fuel consumption refer mainly to emissions from the use of coal as an energy source.

Sources: The World Bank, *World Development Indicators & Global Development Finance* Catalog (April 2011 edition); national sources

### S15 Access to improved drinking water

#### Access to improved drinking water, percentage of population | 2008

This variable refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public stand-pipe, borehole, protected well or spring, or rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. *Reasonable access* is defined as the availability of at least 20 liters per person per day from a source within 1 kilometer of the dwelling.

Source: World Health Organization, *World Health Statistics 2011*, retrieved May 2011

### S16 Marine trophic intensity

#### Trend line slope | 2004

This indicator measures the slope of the trend line in the Marine Trophic Index (MTI) from 1980 to 2004. If the slope is 0 or positive, the fishery is either stable or improving. If the slope is negative (below 0), it means the fishery is declining, and that smaller and smaller fish are being caught. Using the Sea Around Us website, data were gathered on the slope of the trend line in the Marine Trophic Index (MTI) from 1980 to 2004 for a country's exclusive economic zones (EEZs). For countries with more than one EEZ, a weighted average slope was calculated on the basis of the relative size of the EEZs. The marine trophic level ranges from 1 in plants to 4 or 5 in larger predators. It expresses the relative position of fish and other animals in the hierarchical food chain that nourishes them. They provide food for small fish that have a trophic level of about 3, and the small fish are eaten by slightly larger fish that have a trophic level of 4, which, in turn, are what large predators such as sharks and marine mammals and humans typically eat (Pauly and MacLean 2003). If the average level at which a country's fisheries are catching fish declines over time, it means that the overall the trophic structure of the marine ecosystem is becoming depleted of larger fish higher up the food chain, and is resorting to smaller fish.

Sources: Environmental Performance Index (EPI), Yale University; the Sea Around Us Project; the Convention on Biological Diversity

### S17 Forest cover change

#### Annual percent change in forest cover between 2000 and 2010 | 2000–2010

Source: Food and Agriculture Organization of the United Nations (FAO), *State of the World's Forests 2011*

### S18 Air pollution

#### Annual average PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers) concentration for 2001–06, population weighted by country | 2010

This indicator is based on satellite data that are then converted to ground-level concentrations using the GEOS-Chem global chemical transport model to account for the meteorological and chemical factors that influence the spatially and temporally varying relationship between column and surface concentrations. The 0.1 × 0.1° resolution aerosol optical depth (AOD) values for 2001–06 are derived from the NASA Terra MODIS and MISR sensors, averaged to get a 6-year mean AOD for each grid cell, and then population-weighted to better represent human exposure by country.

Source: NASA MODIS and MISR data, processed by Dalhousie University (van Donkelaar et al. [2010]), Battelle, and CIESIN

### S19 Water stress index

#### Percentage of a country's territory affected by oversubscription of water resources | 1995

Countries can to some extent accommodate oversubscription in one region with inter-basin transfers, but these engender significant environmental impacts of their own. Thus, the ultimate target for each country is to have no area of their territory affected by oversubscription. A high degree of oversubscription is indicated when the water use is more than 40 percent of available supply. This indicator is calculated as: Total freshwater withdrawal (surface water + groundwater) + Desalinated water produced + Treated wastewater reused, as a percent of total renewable water resources.

Sources: Environmental Performance Index (EPI), Yale University; University of New Hampshire, Water Systems Analysis Group