

APPENDIXES

SOURCES AND METHODS

Appendix 1: Building the Wealth Estimates

Appendix 2: Wealth Estimates by Country, 2000

**Appendix 3: Genuine Saving Estimates by
Country, 2000**

Appendix 4: Change in Wealth per Capita, 2000

Appendix 1

BUILDING THE WEALTH ESTIMATES

This appendix details the construction of the wealth and genuine saving estimates.

The wealth estimates are composed of the following components:

- Total wealth
- Produced capital
 - Machinery and structures
 - Urban land
- Natural capital
 - Energy resources (oil, natural gas, hard coal, lignite)
 - Mineral resources (bauxite, copper, gold, iron, lead, nickel, phosphate, silver, tin, zinc)
 - Timber resources
 - Nontimber forest resources
 - Cropland
 - Pastureland
 - Protected areas

Intangible capital is calculated as a residual, the difference between total wealth and the sum of produced and natural capital.

Total Wealth

Total wealth can be calculated as $W_t = \int_t^\infty C(s) \cdot e^{-r(s-t)} ds$; where W_t is the total value of wealth, or capital, in year t ; $C(s)$ is consumption in year s ; r is the social rate of return from investment.¹ The social rate of return from investment is equal to: $r = \rho + \eta \frac{\dot{C}}{C}$; where ρ is the pure rate of time preference, η is the elasticity of utility with respect to consumption. Under the assumption that $\eta = 1$, and that consumption grows at a constant rate, then total wealth can be expressed as:

$$W_t = \int_t^\infty C(t) \cdot e^{-\rho(s-t)} ds \quad (A.1)$$

The current value of total wealth at time t is a function of the consumption at time t and the pure rate of time preference.

Expression (A.1) implicitly assumes that consumption is on a sustainable path, that is, the level of saving is enough to offset the depletion of natural resources. The calculation of total wealth requires that, in computing the initial level of consumption, the following issues be considered:

- *The volatility of consumption.* To solve this problem we used the average of three years of consumption.
- *Negative rates of adjusted net saving.* When adjusted net saving is negative, countries are consuming natural resources, jeopardizing the prospects for future consumption. A measure of sustainable consumption needs to be derived in this instance.

Hence, the following adjustments were made:

- Wealth calculation considered consumption series for 1998–2000.
- For the years in which adjusted net saving was negative, adjusted net saving was subtracted from consumption to obtain *sustainable* consumption, that is, the consumption level that would have left the capital stock intact.
- The corrected consumption series were then expressed in constant 2000 dollars.
- The average of constant dollars consumption between 1998 and 2000 was used as the initial level of consumption.

For computation purposes, we assumed the pure rate of time preference to be 1.5 percent (Pearce and Ulph 1999), and we limited the time horizon to 25 years. This time horizon roughly corresponds to a generation. We adopted the 25-year truncation throughout the calculation of wealth.

Machinery, Equipment, and Structures

For the calculation of physical capital stocks, several estimation procedures can be considered. Some of them, such as the derivation of capital stocks from insurance values or accounting values or from direct surveys, entail enormous expenditures and face problems of limited availability and adequacy of the data. Other estimation procedures, such as the accumulation methods and, in particular, the perpetual inventory method (PIM), are cheaper and more easily implemented since they only require investment data and information on the assets' service life and depreciation patterns. These methods derive capital series from the accumulation of investment series and are the most popular. The PIM is, indeed, the method adopted by most OECD countries that make estimations of capital stocks (Bohm and others 2002; Mas and others 2000; Ward 1976).

In our estimations of capital stocks we also use the PIM. The relevant expression for computing K_t , the aggregate capital stock value in period t , is then given by:

$$K_t = \sum_{i=0}^{19} I_{t-i} (1 - \alpha)^i \quad (\text{A.2})$$

where I is the value of investment in constant prices and α is the depreciation rate. In equation (A.2) we implicitly assume that the accumulation period (or service life) is 20 years.² The depreciation pattern is geometric with $\alpha = 5$ percent assumed to be constant across countries and over time.³ Finally, note that equation (A.2) implies a "One-Hoss-Shay" retirement pattern—the value of an asset falls to zero after 20 years.

To estimate equation (A.2) we need long investment series or, alternatively, initial capital stocks.⁴ Unfortunately, initial capital stocks are not available

for all the countries considered in our estimation, and even in the cases in which there are published data (such as for some OECD countries), their use would introduce comparability problems with other countries for which those data do not exist.

The investment series for the 65 countries with complete data coverage extend from 1960 to 2000. For 16 countries, complete investment series are not available, but for the missing years we have data on output, final consumption expenditure (private and public), exports, and imports. With this information we can derive investment series from the national accounting identity $Y = C + I + G + (X - M)$ by subtracting net exports from gross domestic saving. In all the cases, the ratios of the investment computed this way and the original investment in the years in which both series are available are very close to one. Still, to ensure the comparability between both investment series, we divided the investment estimates derived from the accounting identity by the country-specific median of these ratios for each country.

With investment series for 81 countries covering the period 1960–2000, it is even possible to compute capital series estimates that go back to 1979. For the rest of the countries for which the original investment series are not complete (because of lack of data on gross-fixed capital formation or on the required terms to apply the national accounting identity over the period 1960–2000), we tried to overcome the data limitations using a quite conservative approach. We extended the investment series by regressing the logarithm of the investment output ratio on time, as in Larson and others (2000). However, we did not extrapolate output, limiting the extension of the investment series to cases in which a corresponding output observation was available.

Urban Land

In the calculation of the value of a country's physical capital stock, the final physical capital estimates include the value of structures, machinery, and equipment, since the value of the stocks is derived (using the perpetual inventory model) from gross capital formation data that account for these elements. In the investment figures, however, only

land improvements are captured. Thus, our final capital estimates do not entirely reflect the value of urban land.

Drawing on Kunte and others (1998) urban land was valued as a fixed proportion of the value of physical capital. Ideally, this proportion would be country-specific. In practice, detailed national balance sheet information with which to compute these ratios was not available. Thus, as in Kunte and others (1998), we used a constant proportion equal to 24 percent:⁵

$$U_t = 0.24K_t \quad (\text{A.3})$$

Energy and Mineral Resources

In this section, the methodology used in the estimation of the value of nonrenewable resources is described. At least three reasons lie behind the difficulties in such calculations. First, the importance of the inclusion of natural resources in the national accounting systems has been recognized only in the last decades, and although efforts to broaden the national accounts are being made, they are mostly limited to international organizations (such as the UN or the World Bank). Second, there are no private markets for subsoil resource deposits to convey information on the value of these stocks. Third, the stock size is defined in economic terms—reserves are “that part of the reserve base which could be economically extracted or produced at the time of determination”—and, therefore, it is dependent on the prevalent economic conditions, namely technology and prices.⁶

Despite all these difficulties, dollar values were assigned to the stocks of the main energy resources (oil, gas, and coal⁷) and to the stocks of 10 metals and minerals (bauxite, copper, gold, iron ore, lead, nickel, phosphate rock, silver, tin, and zinc) for all the countries that have production figures.

The approach used in our estimation is based on the well-established economic principle that asset values should be measured as the present discounted value of economic profits over the life of the resource. This

value, for a particular country and resource, is given by the following expression:

$$V_t = \sum_{i=t}^{t+T-1} \pi_i q_i / (1+r)^{(i-t)} \tag{A.4}$$

where $\pi_i q_i$ is the economic profit or total rent at time i (π_i denoting unit rent and q_i denoting production), r is the social discount rate, and T is the lifetime of the resource.

Estimating Future Rents

Though well understood and hardly questioned, this approach is rarely used for the practical estimation of natural asset values since it requires the knowledge of actual future rents. Instead, simplifications of (A.4) that implicitly predict future rents based on more or less restrictive assumptions (such as constant total rents, optimality in the extraction path) are used.

The simplification used here assumes that the unit rents grow at rate g :

$\frac{\dot{\pi}}{\pi} = g = \frac{r}{1 + (\epsilon - 1)(1+r)^T}$, where $\epsilon = 1.15$ is the curvature of the cost function, assumed to be isoelastic (as in Vincent 1996). Then, the effective discount rate is r^* , $r^* = \frac{r-g}{1+g}$, and the value of the resource stock can be expressed as:

$$V_t = \pi_t q_t \left(1 + \frac{1}{r^*} \right) \left(1 - \frac{1}{(1+r^*)^T} \right) \tag{A.5}$$

This expression is used to value resource stocks when extraction will extend beyond the year 2000.

Choice of T

To guide the choice of an exhaustion-time value, we computed the reserves to production ratios for all the countries, years, and resources.⁸ Table A1 provides the median of these ratios for the different resources.

Table A.1 Median Lifetime Years

Energy		Metals and Minerals	
Oil	17	Bauxite	178
Gas	36	Copper	38
Hard coal	122	Gold	16
Soft coal	192	Iron ore	133
		Lead	18
		Nickel	27
		Phosphate	28
		Tin	28
		Silver	22
		Zinc	17

With the exception of the very abundant coal, bauxite, and iron, the reserves-to-production ratios tend to be around 20 to 30 years. As in World Bank (1997), we chose the smaller $T = 20$ for all the resources and countries. From a purely pragmatic point of view, the choice of a longer exhaustion time would demand increasing the time horizon for the predictions of total rents (to feed equation [A.4]). On the other hand, rents obtained further in the future have less weight since they are more heavily discounted. Finally, the level of uncertainty increases the more remote the future is. Under uncertainty, it is unlikely that companies or governments develop reserves to cover more than 20 years worth of production.

Timber Resources

The predominant economic use of forests has been as a source of timber. Timber wealth is calculated as the net present value of rents from roundwood production. The estimation then requires data on roundwood production, unit rents, and the time to exhaustion of the forest (if unsustainably managed).

The annual flow of roundwood production is obtained from the Food and Agriculture Organization of the United Nations database

(FAOSTAT).⁹ Calculating the rent is more complex. Theoretically, the value of standing timber is equal to the discounted future stumpage price received by the forest owner after taking out the costs of bringing the timber to maturity. In practice, stumpage prices are usually not readily available, and we calculated unit rents as the product between a composite weighted price times a rental rate.

The composite weighted price of standing timber is estimated as the average of three different prices (weighted by production): (1) the export unit value of coniferous industrial roundwood; (2) export unit value of nonconiferous industrial roundwood; and (3) an estimated world average price of fuelwood. Where country level prices are not available, the regional weighted average is used.¹⁰

Forestry production-cost data are not available for all countries. Consequently, regional rental rates ($[\text{price}-\text{cost}]/\text{price}$) were estimated using available studies and consultation with World Bank forestry experts.

Since we applied a market value to standing timber, it was necessary to distinguish between forests available and forests not available for wood supply because some standing timber is simply not accessible or economically viable. The area of forest *available for wood supply* was estimated as forests within 50 kilometers of infrastructure.

Rents were capitalized using a 4 percent discount rate to arrive at a stock of timber resources. The concept of sustainable use of forest resources is introduced via the choice of the time horizon over which the stream is capitalized. If roundwood harvest is smaller than net annual increments, that is, the forest is sustainably harvested, the time horizon is 25 years. If roundwood harvest is greater than the net annual increments, then the time to exhaustion is calculated. The time to exhaustion is based on estimates of forest volume divided by the difference between production and increment. The smaller of 25 years and the time to exhaustion is then used as the resource lifetime.

Roundwood and fuelwood production data are for the year 2000, taken from FAOSTAT forestry data online. Data on industrial roundwood (wood in rough) for coniferous and nonconiferous production were obtained from the United Nations Food and Agriculture Organization (UNFAO 2000) yearbook: *Forest Products 1997–2001*. Fuelwood price data are from FAOSTAT forestry data online. Roundwood export prices are calculated from data from UNFAO *Forestry Products 1997–2001*.

Studies used as a basis for estimating rental rates were Fortech 1997; Whiteman 1996; Tay and others 2001; Lopina and others 2003; Haripriya 1998; Global Witness 2001; Eurostat 2002.

Nontimber Forest Resources

Timber revenues are not the only contribution forests make. Nontimber forest benefits such as minor forest products, hunting, recreation, watershed protection, and option and existence values are significant benefits not usually accounted. This leads to forest resources being undervalued. A review of nontimber forest benefits in developed and developing countries reveals that returns per hectare per year from such benefits vary from \$190 per hectare in developed countries to \$145 per hectare in developing countries (based on Lampietti and Dixon 1995 and on Croitoru and others 2005, and adjusted to 2000 prices). We assume that only one-tenth of the forest area in each country is accessible, so this per hectare value is multiplied by one-tenth of the forest area in each country to arrive at annual benefits. Nontimber forest resources are then valued as the net present value of benefits over a time horizon of 25 years.⁹

Cropland

Country-level data on agricultural land prices are not widely published, and even if local data were available, it is arguable that land markets are so distorted that a meaningful comparison across countries would be difficult. We have therefore chosen to estimate land values based on the present discounted value of land rents, assuming that the products of the land are sold at world prices.

The return to land is computed as the difference between market value of output crops and crop-specific production costs. Nine representative crops were taken mainly based on their production significance in terms of sowing area, production volume, and revenue. With these three aspects taken into consideration the following nine representative crops were considered: maize, rice, wheat, bananas, grapes, apples, oranges, soybeans,

and coffee. Maize, rice, and wheat were calculated individually because they occupy most of the world's agricultural land resources. Bananas, grapes, apples, and oranges were used as proxies for the broader category of fruits and vegetables. Soybeans and coffee were used as proxies for the broader categories of oil crops and beverages, respectively. Roots, pulses, and other crops were calculated as the residual of total arable and permanent cropland minus the sowing areas of the above nine categories.

The annual economic return to land is measured as a percentage of each crop's production revenue, otherwise known as the rental rate. The calculated rental rates were obtained from a series of sector studies. For example, the rental rate for rice uses information on rental rates for the Lao People's Democratic Republic (67.6 percent), Egypt (30.6 percent), and Indonesia (56.1 percent) to obtain a world rental rate for rice of 51 percent. The other rental rates used are 30 percent for maize (from China, Egypt, Yemen), 34 percent for wheat (from Egypt, Yemen, Mongolia, Ecuador), 27 percent for soybeans (from China, Brazil, Argentina), 8 percent for coffee (from Nicaragua, Peru, Vietnam, Costa Rica), 42 percent for bananas (from Brazil, Colombia, Costa Rica, Cote d'Ivoire, Ecuador, Martinique, Suriname, Yemen), 31 percent for grapes (from Moldova, Argentina), 36 percent for apples and oranges (the value is based on the average for bananas and grapes, as no sector studies were found).

The crop-specific ratios are then multiplied by values of production at world prices. This has the effect of assigning higher land rents to more-productive soils. However, applying average crop-specific ratios in this manner probably understates the value of the most-productive lands and overstates the value of the least-productive land within a country.

A country's overall land rent is calculated as a weighted average (weighted by sowing areas) of rents from the 10 crop categories. Return to land for the 10th category (roots, pulses, and other crops) is calculated differently. Since there is no representative crop for it, the land rent is calculated as 80 percent of the weighted average (weighted by sow area) of the three major cereals. This is based on the assumption that roots, pulses, and other crops yield lower returns to land per hectare.

In order to reflect the sustainability of current cultivation practices, the annual return in 2000 is projected to the year 2020 based on growth in production (land areas are assumed to stay constant). Between 2020 and 2024, the value of production was held constant. The growth rates are

0.97 percent and 1.94 percent in developed and developing countries, respectively (Rosengrant and others 1995). The discounted present value of this flow was then calculated using a discount rate of 4 percent.

Pastureland

Pastureland is valued using methods similar to those for cropland. The returns to pastureland are assumed to be a fixed proportion of the value of output. On average, costs of production are 55 percent of revenues, and therefore, returns to pastureland are assumed to be 45 percent of output value. Value of output is based on the production of beef, lamb, milk, and wool valued at international prices. As with croplands, this rental share of output values is applied to country-specific outputs of pastureland valued at world prices. The present value of this flow is then calculated using a 4 percent discount rate over a 25-year time horizon.

In order to reflect the sustainability of current grazing practices, the annual return in 2000 is projected to the year 2020 based on growth in production (land areas are assumed to stay constant). Between 2020 and 2025, the value of production was held constant. The growth rates are 0.89 percent and 2.95 percent in developed and developing countries respectively (Rosengrant and other 1995). The discounted present value of this flow was then calculated using a discount rate of 4 percent.

Protected Areas

Protected areas provide a number of benefits that range from existence values to recreational values. They can be a significant source of income from a thriving tourist industry. These values are revealed by a high willingness to pay for such benefits. The establishment and good maintenance of protected areas preserve an asset for the future, and

therefore protected areas form an important part of the natural capital estimates. The willingness to pay to preserve natural regions varies considerably, and there is no comprehensive data set on this.

Protected areas (the World Conservation Union [IUCN] categories I–VI) are valued at the lower of per-hectare returns to pastureland and cropland—a quasi-opportunity cost. These returns are then capitalized over a 25-year time horizon, using a 4 percent discount rate. Limiting the value of protected areas to the opportunity cost of preservation probably captures the minimum value, but not the complete value, of protected areas.

Data on protected areas are taken from the World Database of Protected Areas (WDPA), which is compiled by the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC). Given the frequent revisions to the database, the data used are for 2003. In the cases of missing data on protected areas, they were assumed to be zero.

Calculating Adjusted Net Saving

Adjusted net saving measures the change in value of a specified set of assets, that is, the investment/disinvestment in different types of capital (produced, human, natural). The calculations are not comprehensive in that they do not include some important sources of environmental degradation such as underground water depletion, unsustainable fisheries, and soil degradation. This results from the lack of internationally comparable data, rather than intended omissions. A detailed description of the methodology to obtain adjusted net saving can be found at the World Bank's Environmental Economics website (www.worldbank.org/environmentaleconomics). The following table summarizes the definitions, data sources, and formulas used in the calculations.

Table A.2 Calculating Adjusted Net Saving

Item	Definition	Formula	Sources	Technical notes	Observations
Gross national saving (GNS)	The difference between GNI and public and private consumption plus net current transfer.	$GNS = GNI - \text{private consumption} - \text{public consumption} + \text{net current transfers}$	WDI, OECD, UN		
Depreciation (Depr)	The replacement value of capital used up in the process of production.	(data taken directly from source or estimated)	UN	Where country data were unavailable, they were estimated as follows. Available data on depreciation as a percentage of GNI were regressed against the log of GNI per capita. This regression was then used to estimate missing depreciation data. Regression: $\text{Dep}/\text{GNI} = a + (b * \ln(\text{GNI}/\text{cap}))$. The regression was estimated on a five-yearly basis (that is, regression in 1970 was used to estimate depreciation as a percent GNI in years 1970–1974.) Where data were missing for only a couple of years in a country, the same rate of depreciation as a percentage of GNI was applied.	UN data are not available after 1999 for most countries. Missing data are estimated.
Net national saving (NNS)	Difference between gross national saving and the consumption of fixed capital.	$NNS = GNS - \text{Depr}$			
Education expenditure (EE)	Public current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment.	(data taken directly from source or estimated)	Current education expenditure (public): UNESCO	When data are missing, estimation is done as follows: (1) for gaps between two data points, missing information is filled by calculating the average of the two data points; (2) for gaps after the last data point available, missing information is filled on the assumption that education expenditure is a constant share of GNI.	The variable does not include private investment in education. It only includes public expenditures, for which internationally comparable data are available. Notice that education expenditure data are only available up to 1997. One dollar's current expenditure on education does not necessarily yield exactly one dollar's worth of human capital (see, for example, Jorgensen and Fraumeni 1992). However, an adjustment from standard national accounts is needed. In national accounts, nonfixed-capital expenditures on education are treated strictly as consumption. If a country's human capital is to be regarded as a valuable asset, expenditures on its formation must be seen as an investment.

Item	Definition	Formula	Sources	Technical notes	Observations
Energy depletion (ED)	Product of unit resource rents and the physical quantities of energy extracted. It covers coal, crude oil, and natural gas.	$ED = \text{production volume} \times \text{average international market price} \times \text{unit resource rent}$	Quantities: OECD, British Petroleum, International Energy Agency, International Petroleum Encyclopedia, United Nations, World Bank, national sources. Prices: OECD, British Petroleum, national sources. Costs: IEA, World Bank, national sources	Energy depletion covers crude oil, natural gas, and coal (hard and lignite). Unit resource rent is calculated as (unit world price – average cost) / unit world price. Notice that marginal cost should be used instead of average cost in order to calculate the true opportunity cost of extraction. Marginal cost is, however, difficult to compute.	Prices refer to international rather than local prices, to reflect the social cost of energy depletion. This differs from national accounts methodologies, which may use local prices to measure energy GDP. This difference explains eventual discrepancies in the values for energy depletion and energy GDP.
Mineral depletion (MD)	Product of unit resource rents and the physical quantities of mineral extracted. It covers tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.	$MD = \text{production volume} \times \text{average international market price} \times \text{unit resource rent}$	Quantities: USGS (2005) mineral yearbook. Prices: UNCTAD monthly commodity price bulletin. Costs: World Bank, national sources	Mineral depletion covers tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate. Unit resource rent is calculated as (unit price – average cost) / unit price. Notice that marginal cost should be used instead of average cost in order to calculate the true opportunity cost of extraction. Marginal cost is, however, difficult to compute.	Prices refer to international rather than local prices, to reflect the social cost of energy depletion. This differs from national accounts methodologies, which may use local prices to measure mineral GDP. This difference explains eventual discrepancies in the values for mineral depletion and mineral GDP.
Net forest depletion (NFD)	Product of unit resource rents and the excess of roundwood harvest over natural growth.	$NFD = (\text{roundwood production} - \text{increment}) \times \text{average price} \times \text{rental rate}$	Round wood production: FAOSTAT forestry database. Increments: World Bank, FAO, UNECE, WRI, country-specific sources. Rental rates: various sources	In a country where increment exceeded wood extraction, no adjustment to net adjusted saving was made, no matter what the absolute volume or value of wood extracted. Increment per hectare on productive forest land is adjusted to allow for country-specific characteristics of the timber industry.	Net forest depletion is not the monetary value of deforestation. Data on roundwood and fuelwood production are different from deforestation, which represents a permanent change in land use, and thus is not comparable. Areas logged out but intended for regeneration are not included in deforestation figures (see WDI definition of deforestation), but are counted as producing timber depletion. Net forest depletion only includes timber values and does not include the loss of nontimber forest benefits and nonuse benefits.
CO ₂ damages (CO ₂ D)	A conservative figure of \$20 marginal global damages per ton of carbon emitted was taken from Fankhauser (1994).	$CO_2D = \text{emissions (tons)} \times \20	Data on carbon emissions can be obtained from the WDI	Data lag by several years so the data for missing years are estimated. This is done by taking the ratio of average emissions from the last three years of available data to the average of the last three years' GDP in constant local currency unit. This ratio is then applied to the missing years' GDP to estimate carbon dioxide emissions. The atomic weight of carbon is 12 and for carbon dioxide 44, and carbon is only (12/44) of the emissions. Damages are estimated per ton but the emissions data are per kilo ton. The CO ₂ emissions data have therefore been multiplied by $20 \times (12/44) \times 1000$.	CO ₂ damages include the social cost of permanent damages caused by CO ₂ emissions. This may differ (sometimes in large measure) from the market value of CO ₂ emissions reductions traded in emissions markets.

Item	Definition	Formula	Sources	Technical notes	Observations
PM ₁₀ damages (PM ₁₀ D)	Willingness to pay to avoid mortality and morbidity attributable to particulate emissions.	PM ₁₀ D = disability adjusted life years lost due to PM emissions * WTP			
Adjusted net saving (ANS)	Net national saving plus education expenditure and minus energy depletion, mineral depletion, net forest depletion, carbon dioxide damage, and particulate emissions damage.	ANS = NNS + EE – ED – MD – NFD – CO ₂ D – PM ₁₀ D			

Source: Authors.

Endnotes

1. A proof that the current value of wealth is equal to the net present value of consumption can be found in Hamilton and Hartwick 2005.
2. The choice of a service life of 20 years tries to reflect the mix of relatively long-lived structures and short-lived machinery and equipment in the aggregate capital stock and investment series. In a study that derives cross-country capital estimates for 62 countries, Larson and others (2000) also use a mean service life of 20 years for aggregate investment.
3. Again, by choosing a 5 percent depreciation rate we try to capture the diversity of assets included in the aggregate investment series.
4. That is, $K_t = \sum_{i=0}^t I_{t-i}(1-\alpha)^i + K_0$ for $t < 20$.
5. Kunte and others (1998) based their estimation of urban land value on Canada's detailed national balance sheet information. Urban land is estimated to be 33 percent of the value of structures, which in turn is estimated to be 72 percent of the total value of physical capital.
6. U.S. Geological Survey definition. It is clear that an increase in, say, oil price or a reduction in its extraction costs would increase the amount of "economically extractable" oil and therefore increase the reserves. Indeed, U.S. oil production has surpassed several times the proved reserves in 1950.
7. Coal is subdivided into two groups: hard coal (anthracite and bituminous) and soft coal (lignite and subbituminous).

8. The World Bank database provides good coverage on production data for the 14 resources. Oil and gas reserves data from various issues of *The Gas and Oil Journal* are also fairly complete. However, reserves data on coal from *The World Energy Conference* and on metals and minerals from the U.S. Bureau of Mines' *Mineral Commodity Summaries* are less complete. In fact, for the 10 metals and minerals, the reserves-to-production ratios were computed for a limited number of countries starting in 1987, due to data limitations.
9. When data are missing and if a country's forest area is less than 50 square kilometers, the value of production is assumed to be zero.
10. After consultation with World Bank forestry experts, some country-level prices were replaced by the regional average.