Comprehensive wealth and sustainable development in India

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Abstract: Sustainable development requires that the per capita productive base or comprehensive wealth of an economy should, at least, not decline over the period of time. This study provides estimates of the growth rate of per capita comprehensive wealth for the Indian economy for the period 1991-2006. The growth rate of per capita comprehensive wealth is estimated to be 4.39 percent whereas the growth rate of per capita GDP is 4.42 percent. We find that though the growth rate of manufactured and human capital has been more than enough to offset the decline in natural assets, thereby leading to an improvement in the productive base of the economy, the growing resource and energy use intensity remains an issue of major concern.

Keywords: Sustainability, development, human capital, comprehensive wealth

1. INTRODUCTION

Indian economy has been growing at an unprecedented growth rate since 2003-04. Relentless efforts to accelerate economic growth have relegated environmental considerations to secondary status in policy making. For example, damage caused by pollution in India is estimated to cost $14 billion annually; amounting to close to 4.5% to 6% of GDP (Government of India, 1999). This unresponsiveness towards environmental protection has been questioning the sustainability of growth trajectory. Given the trade-offs between environment and development, the objective before a policy should be a balance between economic growth and environmental protection, and the concept of sustainable development may be the guiding force in arriving at such a balance.

Sustainable development is defined as "development, which meets the needs of the present without compromising the ability of future generations to meet their own needs". This definition lacks tractability as it implants many complex economic ideas, especially when one is interested in measuring whether an economy is on a sustainable growth path (Vouvaki and Xepapadeas, 2008). In order to make the definition of sustainable development operational and useful for developing indicators of sustainability many attempts have been made in the literature. According to Dasgupta and Mäler (2000), sustainable development requires that each generation should bestow to its successor at least as large a productive base as it inherited from its predecessor. Productive base can be defined in terms of stock of capital assets and institutions. Capital assets include manufactured capital, human capital and knowledge, and also natural capital. Sustainability, thus, can be equated to non-declining value of the productive base.

This paper aims to provide the estimates of changes in productive base in the country to have an idea about whether India has been on the sustainable development path. It accounts for environmental depletion and degradation and progress in human capital for the period of 1991 to 2006. It builds on previously existing estimates on natural resource valuation/accounting and knits a whole range of adjustments together to analyze the consequences of any change in the productive base of the economy. Though a number of attempts have been made in India for estimating environmentally corrected national or state income, most such estimates are sector specific and pertaining to a specific point in time. The studies commissioned by the Central Statistical Organization (CSO) belong to this category.[1]

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[1] CSO commissioned 8 studies. These studies are available at the CSO webstie: http://mospi.gov.in/mospi_project_issp_ssd.htm

The paper is organized as follows: Section 2 outlines, in brief, the theoretical linkages between well-being, sustainability and productive base of an economy. Section 3 describes the estimation procedure. The empirical application is discussed in Section 4. Section 5 offers some concluding remarks.

2. Well-Being, Sustainability and Productive Base

Hicks (1946) considers the national income as a proxy of well-being, but Samuelson (1961) suggests using some 'wealth like magnitude' such as present discounted value of future consumption for the purpose in hand. Weitzman (1976), using linear social welfare function, shows that NNP is a proxy for the present discounted value of future consumption. Arrow et al. (2003) suggest the use of Ramsey-Koopmans (R-K) formulation as a basis for national income accounting.[2]

Arrow et al. (2003) demonstrate that the time derivative of R-K social welfare function, at a given time *t* measures the rate of change of current social welfare. If the derivative is positive, it implies that current social welfare is positive and genuine investment is increasing. Negative derivative implies that the productive base is in decline and the development is unsustainable. Current productive base determines both the flows of consumption and future capital stocks. Let K_t denote the productive base which is a vector of stocks of all the capital assets at *t*. If *V (inter-temporal social welfare function)* is stationary, then $V_t=V(K_t)$; the time derivative of *V* is

$$dV/dt = \sum_i (\partial V/\partial K_{it})(dK_{it}/dt) + \partial V/\partial t = \underbrace{\sum_i p_{it} I_{it}}_{GenuineInvestment} + \partial V/\partial t \qquad (1)$$

where K_{it} is the stock of the i^{th} capital at time *t*; p_{it} ($\equiv \partial V/\partial K_{it}$) is the shadow price of capital K_{it}; and I_{it} ($\equiv dK_{it}/dt$) is the rate of change in K_{it}. The term ∂V/∂t represents the impact of exogenous factors (other than the accumulation of the capital stock) such as knowledge base and institutions on social welfare. Equation (2) shows that intertemporal social welfare is non-decreasing if and only if genuine investment is non-negative.

However, this expression of sustainability would produce erroneous results for an economy where the population has been growing. Assuming the growth rate of population is constant and exogenous, following Arrow et al. (2003), the equation (1) can be rewritten as

$$dV/dt = \sum_i (\partial V/\partial K_{it})(dk_{it}/dt) + \partial V/\partial t \qquad (2)$$

where k_i is the per capita stock of ith capital.

The stock of per capita comprehensive wealth is defined as $w = \sum_{i=1} p_i k_i$ and a change in per capita comprehensive wealth over the period of time is

$$w_T - w_0 = \sum_i (p_{iT}k_{iT} - p_{i0}k_{io}) - \int_0^T \left(\sum_i \frac{dp_{is}}{ds} k_{is} \right) ds \qquad (3)$$

[2] For details on Ramsey-Koopmans formulation, see Dasgupta (2005)

where the second part of the equation represents capital gains and deducts for the exogenous price changes. Equation (3) has to be non-negative for sustainable economic development.

The maintenance of productive base does not necessarily imply that a particular type of capital asset to be preserved. It allows for substitution between different forms of capital, the substitutability is not perfect since the shadow prices don't remain constant overtime. The dynamics of the shadow prices of different forms of capital assets can take care of the degree of substitution between the capitals and their essentiality. If a particular asset is essential and lacks substitutes in welfare function, the shadow price of the asset will rise fast and sustainable development will not be feasible with a continued depletion of the asset (for details see, Mäler 2007, Ehrlich and Goulder 2007).

3. ESTIMATION PROCEDURE

Comprehensive wealth includes manufactured capital, human capital, natural capital and knowledge base, and evaluates them at their shadow prices. To express the sustainability criterion in terms of rate of change in comprehensive wealth, we take the manufactured capital assets as numeraire and assume that the marketed price of manufactured capital is equal to its shadow price. We use perpetual inventory method to estimate the capital stock. To get the figure of net investment we take estimates of depreciation and investment from World Development Indicators (WDI).[3]

The second component is the human capital. Human capital can be measured using either (i) expenditure on education and health approach or (ii) potential earning approach, and each of the approach has its own pros and cons. Hamilton and Clemens (1999) and Arrow et al (2004) use the expenditure approach, but Arrow et al (2007) follow the potential earning approach. As the objective of the study is to measure the productive base of the economy, therefore, we use potential earning approach in the present study.

The value of human capital using potential earning approach is estimated as: $P_H.H$, where P_H is the shadow price of human capital and H is the stock of human capital. We follow Bils and Klenow (2000) to estimate the figures of human capital (H), which requires information on the total number of workers and average years of schooling. *Census of India* reports the number of total workers. Census in India is conducted at an interval of 10 years. Statistics on the average years of schooling for the employed persons is not available in India. We compute the average years of schooling for the working age population instead from the Census data of 1991 and 2001. Census data contains the statistics on educational attainment of individuals in the working age of 15-64. The average years of schooling for 1991 and 2001 are computed as the weighted average. Where the weight is the number of individuals in a particular schooling cycle and with respect to schooling cycle, we assume that primary schooling take 5 years, middle level requires 8 years, secondary 10 years, higher secondary 12 years and tertiary education requires 16 years. For the remaining years of sample, average years of schooling are obtained by linear interpolation from the benchmark years of the census.

The shadow price of human capital is the discounted sum of the rental price for the average working years remaining. Thus the growth of value of human capital stock results from the growth in H which is the function of growth rate in labour force and educational attainment of the population, and the growth of the shadow price which is linked to the growth in rental value and the average working years remaining which depend on life expectancy in the country. In India, majority of the population is self-employed and it is difficult to get an average annual wage or total wage bill for the country as a whole. Therefore, we take the labour share from a recent growth accounting study carried out by Bosworth and Collins (2008), which assumes 60 percent labour share in GDP. The figures on the average working years remaining are taken from WHO life tables. The figures are available for 1990, 2000 and 2006, for the middle years we assume

[3] http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2

that the growth in working years remaining is uniformly distributed over the period of time. Discount rate is set equal to 12 percent.

Third and most crucial component is to get the estimates of changes in the natural capital. Natural resources are assets for an economy and their value should be measured as the present value of returns over the life of the resources and assets depreciation should be measured as user cost (Atkinson and Hamilton, 2007). We follow Vincent (1997) for estimating the depreciation value of natural resources which Atkinson and Hamilton call a quasi-optimal approach. This approach provides 'an intermediate value between the polar approaches dominant in the resource accounting literature and does yield values for depletion that are a decreasing function of the deposit size, which seems intuitively correct for a 'real world' estimate that does not assume full optimality' (p. 51).

Hartwick rule states that the Hotelling rent received from the extracting of natural resources should be invested in manufactured and human capital so that the current consumption level in a country could be sustained over the period to time (Solow, 1993). Thus, estimation of the Hotelling rent is core of the analysis for valuation of depletion of natural capital. First step in estimating the Hotelling rent is to estimate total rent received from the extraction of a resource. World Bank publishes figures for total rent for energy, minerals and round wood based on international prices.[4] Total rent is equal to average price of the resource times quantity extracted (total revenue) minus total extraction cost. Next step is to convert the total rent figures into the Hotelling rent. Vincent (1997) shows that in a standard model of optimal resource depletion, the Hotelling rent is equal to:

$$HR = TR \times (1+\beta)/[1+\beta(1+\delta)^T] \tag{4}$$

where *HR* and *TR* stand for the Hotelling and total rent respectively, β is the elasticity of extraction cost (defined as the proportionate change in extraction cost due to proportionate change in extraction), δ is the discount rate, and T is the number of years until resource exhaustion. Equation (4) shows the relationship between the Hotelling- and total rent. As the resource approaches exhaustion the Hotelling rent approaches to total rent, but in the beginning of resource exploitation the Hotelling rent is only a fraction of total rent. The formula also shows that a country has to invest more in manufactured and human capital to offset the economic depreciation of natural capital as the resource approaches exhaustion.

To use formula, estimates of elasticity of extraction cost, discount rate and reserve to production ratios as a proxy for the life of the resource in question are needed. Extraction cost functions are estimated using the World Bank data of total extraction costs. Discount rate is assumed equal to 12 percent. It is assumed that in 1970 all the resources had a life of 50 years.

Land degradation is a serious environmental problem in India. It occurs through the natural and man-made processes of wind erosion, water erosion, and waterlogging. The value of economic depreciation of land quality is equal to the change in the discounted sum of agricultural rents that arise in the presence of land degradation. If land markets are working efficiently and all other factors that determine current and future agricultural land rent remain constant except land quality, then the economic depreciation of land is equal to the change in land value between time periods. In India, land markets are too distorted. Therefore, following Vincent and Castaneda (1997), productivity change method is used. According to productivity change method the depletion value of a unit of soil is equal to the capitalized value of future agricultural revenue that

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[4] http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEEI/0,,contentMDK:20502388~menuPK:1187778~pagePK:148956~piPK:216618~theSitePK:408050,00.html as accessed on July 30, 2008. Resource accounting or wealth accounting requires use of domestic prices. Use of international prices introduces upward bias as generally the international prices are higher than domestic prices because only better quality commodities tend to be traded.

is forgone due to the loss of that unit. The economic depreciation of land degradation is computed as a product of the following three items: (i) value added in the agriculture sector, (ii) the percentage of degraded agricultural land, and (iii) the ratio of capitalized value of foregone future agricultural revenue to current value added.

Wealth accounting approach requires the shadow value of each type of capital to account for the discounted value of the environmental damages caused by the use of that capital. The shadow value of manufactured and human capitals is reduced by the damages caused by environmental externalities of local air and water pollution as well as the effects of global warming. The present paper accounts for the damages caused by global CO_2 emissions, local particulate matters and industrial water pollution in India.

To adjust the measures of comprehensive wealth for damages due to global warming we follow Arrow et al (2007). To have an idea about the damages we utilize Nordhaus and Boyer (2000) study estimates from a CO_2 emission scenario that are constrained to a mean surface temperature rise of 2.5 degrees Celsius over the entire terrestrial environment. Based on this scenario, Nordhaus and Boyer estimates 1.5 percent loss in global production and India will suffer losses of 5 percent of its GDP. The observed CO_2 global emission figures we take from WDI and the shadow price of these emissions, following Tol (2005), is taken equal to US$50 per ton to estimate the global damages. We multiply India's expected damage by its GDP and global damage by global GDP in the year of interest and then calculate the portion of global damages that India would suffer. To get the monetary figure of damages suffered by India due to global emissions we multiply the percentage of global loss that India suffers by the total global damages.

An increase in the air pollution level raises public mortality and morbidity in India (Cropper et al, 1997). A tentative estimate of health costs of urban air pollution in India was estimated to be US $1.4 billion (Brandon and Homman, 1995). There have been relatively very few comprehensive studies on the health damage cost of air pollution in the Indian context. Whatever studies are available they are site specific and none of them is estimating the shadow price of particulate matters at margin. Therefore, given the huge diversity in India with respect to air pollution, we rely on the estimates provided by the WDI. WDI values the particulate matters using the various estimates of willingness to pay and provides estimates of damages caused by particulates since 1990. India has been losing about US$ 7 billion per year.

The quality of surface and ground water has deteriorated significantly over the last two decades. Murty and Kumar (2011) observe that in India the main sources of water pollution are industrial and urban residential sectors. In the present study we account for the untreated industrial water pollution above the national standards. To account for industrial water pollution in the wealth accounts we need information on the untreated water pollution above the national standards and their shadow prices. Shadow prices of the water pollutants can be estimated either in terms of social cost of exposure to water pollution (e.g., health cost of exposure to water pollution) or marginal cost of abatement; in equilibrium position these two estimates are equal (Färe and Grosskopf, 1998). In the absence of former estimates, we rely on the estimates of abatement cost. Murty and Kumar (2004) estimate shadow cost of untreated industrial water pollution using distance function approach. They estimate marginal abatement cost for three major water pollutants: BOD, COD and SS for the 17 major polluting industries for the years 1995-96 and 1996-97. They find that these costs are about 2.47 percent of the value added in the industrial sector. Note that these abatement costs relate to the water pollution that is above the MINAS (minimum national standards) and remains untreated.

Capital gain can be measured as the product of the stock of natural resource and the rate of increase of the shadow price. In a closed economy there is no need to make adjustment in wealth for capital gains or losses, since the gains to resource owners are offset by the losses of the consumers (Arrow et al., 2007). However, in an open economy the owners and consumers of the resource differ; it is imperative to take account of changes in resource prices on the sustainability of a nation.

India both imports and exports natural resources. In India the resource depletion values are small (in relation to GDP). So the capital gains and losses arising from the portion of this depletion that is traded will be even smaller. However, India depends for about 80 percent of her consumption on imported oil. Therefore in the present study we make adjustments for capital gains/losses only for oil resources. Following, Arrow et al. (2007), we calculate capital gains for the whole world and distribute these gains as a loss to India according to its fraction of world total oil consumption.

Increasing populations are considered as a major reason for the destruction and depletion of natural resources. If populations are increasing then the wealth is shared between more people, therefore the estimates of comprehensive wealth we adjust for the growth rate of population.

Growth accounting literature shows that the growth rate of income or output is generally higher than the growth rate of inputs. Dasgupta (2007) argues that the growth rate in total factor productivity (TFP) occurs due to improvements in the existing body of knowledge and the working of institutions. The conventional productivity studies consider the production of marketed output as a function of manufactured capital and labor, and ignore the contribution of natural resources in the production activities. Kumar and Managi (2009a) estimate TFP for a large number of countries using three inputs, viz. labor, manufactured capital and energy use, for producing GDP and the emissions of CO_2 and SO_2 applying directional distance function approach. They observe significant difference in the estimates of TFP when natural capital is taken into account and we use these estimates of TFP in computing the growth rate of per capita comprehensive wealth.

4. EMPIRICAL APPLICATION

The World Bank data is used for estimating change in value and composition of genuine investment. Since 1999, the World Bank provides estimates of adjusted net savings, known as genuine savings, for a large number of countries starting from 1970 in its the World Development Indicators (WDI).[5]

The present application proceeds in two steps. First, it estimates change in the natural capital by estimating the Hotelling rent for exhaustible (energy-[6] and mineral resources[7]) and renewable natural resources (e.g., forest stock) and makes adjustments for capital gains and losses. It also estimates value of environmental degradation for soil, air (carbon and particulate emissions) and water pollution. It then adjusts for changes in net investment in human capital formation using potential earning approach. In the second step, it considers the changes in comprehensive wealth on per capita basis and makes adjustment for changes in TFP growth.

Table 1 shows total minerals, energy and round-wood rents as a proportion of net domestic savings/investments as well as gross Domestic Products.[8] The rate of natural resource extraction which stood at 5% of GDP in 1990 showed a declining trend until about the year 2003. The trend got reversed thereafter and in 2006, it stood at 6% of the GDP. Similarly, as proportion of net domestic investment the rent earned on natural resource extraction declined from about a half to a quarter. Though small relative to GDP, the rent from natural resources extraction, nevertheless, constitute a significant source of net domestic investment. Regarding energy and minerals, the depletion relative to GDP is increasing which suggests that the resource use intensity of the economy is increasing. It is interesting to note that the depletion in forest

[5] http://devdata.worldbank.org/dataonline

[6] Energy resources include oil, natural gas, coal and lignite.

[7] Minerals include bauxite, copper, lead, nickel, phosphate, tin, zink, gold, silver, and iron ore. For India data is available for 8 minerals, i.e., it is not available for nickel and tin.

[8] Note that in India capital formation is to a large extent financed by the domestic savings, therefore there is no major difference between the figures of genuine saving and genuine investment (Mohan, 2008).

resources relative to GDP is almost constant during 1990s and then it slightly increases and remains constant.

Table 2 provides the estimates of environmental damages relative to net domestic investment. Column 1 of the table shows that the ratio of Hotelling rent to net domestic investment overtime; it is about 8 percent in 2006 indicating that the net investment has been much more than adequate to offset natural resource depletion. But as damages from environmental degradation (soil, air and water pollution) are included, it is found that in 1990s the net investment was about double to total environmental damages. Overtime, a declining trend in economic depreciation of the environmental assets relative to net investment is observed, *per se* indicating that the net investment is enough to offset the environmental damages.

Table 3 shows the various estimates of investment in India since 1991 in monetary values. Though, there has been an increasing trend in both net as well as genuine investment; genuine investment has consistently been far below the gross investment figures, though the gap between the two has narrowed overtime. By 2006, while gross investment reached the level of 31 percent of GDP, genuine investment was about 24 percent of GDP. Downward trend in the difference in gross and genuine investment rates could be attributed to various factors such as structural changes in the economy, change in the development strategy in 1991, increased spreads of education coupled with increase in life expectancy at birth, complete ban on green felling in 1996 by the Supreme Court of India, declining carbon intensity of the economy, improvements in environmental regulatory performance and increasing environmental awareness. The issue of grave concern is the increasing resource and energy use intensity of the economy. Ayres (2008) calls for a radical change in the development trajectory. He says that nations should concentrate on increasing resource productivity; "…goods must be converted as much possible into services, and services must be delivered with the minimum possible requirement for material and energy inputs" (p11).

Figure 1 scatters genuine investment against growth rate of per capita GDP. It appears that India never observed negative genuine investment and there is a clear upward trend in the scatter; as the economy's health improves genuine investment increases. This result is very striking given the fact that many countries under US$ 1000 per capita income have negative genuine saving/investment rates (Hamilton and Hassan, 2003).

Growth rate of comprehensive wealth is computed by dividing the figures for genuine investment by the incremental capital output ratio (ICOR). To compute per capita figures, growth rate of population is subtracted from the figure of growth rate of comprehensive wealth. These figures for per capita growth rate of comprehensive wealth are further adjusted for the growth rate in total factor productivity (TFP).

The ICOR for India has lingered around 4.[9] This measure of capital intensity does include only manufactured capital, and to account for human and natural capital, therefore, the observed ICOR is increased by one. The estimates of TFP growth rate are available until 2000; therefore, it is assumed that in the later years TFP growth rate is constant and equal to of its value in 2000. This assumption may bias the estimates of growth rate of per capita comprehensive wealth downward for the corresponding period. The mean contribution of TFP in per capita GDP growth was about 57 percent during the study period.

Table 4 presents the trend in the growth rate of per capita comprehensive wealth and per capita GDP, and it also provides the estimates of per capita comprehensive wealth in monetary values.[10] These figures provide some important insights on the question of sustainability of Indian growth trajectory. First, both per capita- GDP and comprehensive wealth are continuously increasing since 1991 (Figure 2). Second, in the growth rate of per capita- GDP and

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[9]ICOR figures are generated using the formula, $g = s / c$ where g is the growth rate of GDP, s is the gross saving rate measured a ratio of GDP and c is the incremental capital output ratio.

[10] Initial year's capital stock is estimated following Nehru and Dhareshwar (1993)

comprehensive wealth, the contribution of technological changes is substantial. During 1991-2000, it is the TFP growth rate that converted per capita comprehensive wealth rate into positive figures if we ignore the human capital growth. We observe the contribution of TFP in the growth rate of comprehensive wealth was about 51 percent during 1991-2006 and about 44 percent during 2001-2006.

Third, per capita GDP increased at the rate of 4.42% per year and the growth rate of per capita comprehensive wealth was 4.39 percent. For the period 2001 to 2006, the growth rates of per capita GDP was 5.78% and comprehensive wealth was 7.58% per year. These results reveal that the growth trajectory followed by the Indian economy during the post liberalization period has been sustainable. The growth rate of manufactured and human capital was more than enough to offset the decline in natural assets and the productive base of the economy has been improving. Lastly, the estimates of per capita comprehensive wealth are comparable with World Bank (2006), though the estimation procedure and components included differ.

5. CONCLUSIONS

This paper has tried to examine the question whether India's development has been sustainable over time using the sustainability criterion. Sustainability is defined in terms of productive base of the economy which includes manufactured, human, and natural capital, knowledge base and institutions. The criterion of sustainability is satisfied if productive base is increasing on a per capita basis.

It is observed that the depreciation of natural resources is a significant source of net domestic investment. Though carbon intensity of GDP is declining, increasing resource and energy use intensity of the economy remains the cause for concern. The exponential growth in the Hotelling to total rent ratio overtime, reflecting an unacceptable scale of resource depletion, calls for increased investment in building both human and manufactured capital. Though overtime both gross investment and genuine investment were increasing, genuine investment was far below the gross investment. Nevertheless, note that India never observed negative genuine investment and there is positive association between the per capita GDP growth rate and genuine investment rate.

The empirical analysis suggests that Indian economy has been on a sustainable development path; both per capita- GDP and comprehensive wealth have increased since 1991. Besides, life expectancy at birth has increased and under-5 mortality has declined significantly.

These results must be viewed as preliminary and tentative. Many significant natural resources damages such as loss of biodiversity, depletion of water resources, loss on account of off-site land degradation, which may bias the estimates in upward direction, have been ignored in the study. Note that the estimates are based on the assumption that market prices are equal to the shadow prices of natural assets. Since, market prices don't reflect social costs of consumption of natural capital, the use of market prices could have biased the estimates of genuine investment in the upward direction

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Table 1: Role of Natural Resources in GDP and Investment (%)

Year	Total Rent to Net Domestic Investment	Total Rent to Gross Domestic Product
1991	49.00	5.49
1992	51.52	5.73
1993	38.83	4.35
1994	27.48	3.69
1995	27.94	4.21
1996	35.77	3.91
1997	29.92	3.70
1998	28.00	3.10
1999	20.99	3.08
2000	29.33	4.16
2001	32.18	4.45
2002	25.26	3.81
2003	21.72	3.70
2004	25.62	5.24
2005	26.06	5.60
2006	27.22	6.00

Table 2: Ratio of Environmental Damages to Net Domestic Investment (%)

Year	Hotelling Rent (Resource Depletion) (1)	Environmental Degradation (2)	Total Environmental Damage (3) = (1) + (2)
1991	2.64	49.00	51.64
1992	3.11	51.52	54.63
1993	2.60	38.83	41.43
1994	2.05	27.48	29.53
1995	2.35	27.94	30.29
1996	3.36	35.77	39.13
1997	3.13	29.92	33.05
1998	3.29	28.00	31.28
1999	2.73	20.99	23.72
2000	4.25	29.33	33.58

2001	5.30	32.18	37.48
2002	4.56	25.26	29.82
2003	4.37	21.72	26.08
2004	5.84	25.62	31.47
2005	6.54	26.06	32.59
2006	7.57	27.22	34.79

Table 3: Genuine Investment and Its Components (2000US$ billions)

Year	Net Domestic Investment	Human Capital Formation	Natural Capital Formation	Capital Gains/ Losses	Genuine Investment
1991	30.65	47.57	-33.54	-6.83	37.83
1992	32.06	50.09	-34.78	-1.33	46.05
1993	33.81	52.63	-36.04	-4.41	45.98
1994	43.30	55.93	-37.99	-1.90	59.35
1995	52.27	60.34	-39.65	3.19	76.15
1996	40.75	65.09	-42.98	8.87	71.72
1997	47.98	67.88	-43.41	-3.65	68.81
1998	45.64	72.29	-45.35	-22.00	50.58
1999	64.94	77.85	-47.29	15.75	111.25
2000	65.25	81.18	-48.27	42.34	140.49
2001	66.96	85.65	-51.37	-18.06	83.18
2002	75.77	89.08	-50.54	1.76	116.06
2003	92.89	96.81	-55.43	15.95	150.22
2004	120.62	105.12	-60.31	34.96	200.39
2005	138.61	115.27	-66.53	55.77	243.11
2006	155.76	126.70	-73.74	37.19	245.91

Table 4: Per Capita Comprehensive wealth and Its Growth Rate

Year	Per Capita Comprehensive Wealth (2000US$)	Growth Rate of Per Capita Comprehensive wealth	Growth rate of Per Capita GDP
1991	6039	1.42	-0.92
1992	6130	1.5	3.53
1993	6214	1.37	2.84
1994	6341	2.05	4.75
1995	6511	2.67	5.67
1996	6658	2.27	5.68
1997	6885	3.4	2.26
1998	7084	2.9	4.38
1999	7248	2.31	5.58
2000	7602	4.88	2.31
2001	8201	7.88	3.52
2002	8755	6.75	2.13
2003	9402	7.39	6.79

2004	10125	7.69	6.79
2005	10871	7.37	7.75
2006	11782	8.38	7.7