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AN ANALYTICAL FRAMEWORK FOR SUSTAINABLE DEVELOPMENT AND ITS MEASUREMENT

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"Sustainable development is development that ensures non - declining per capita national wealth by replacing or conserving the sources of that wealth, that is, stocks of produced, human, social and natural capital"

UN, European Commission, IMF, OECD and World Bank (2003): Handbook of National Accounting, Integrated Environmental and Economic Accounting, SEEA, page 4.

INTRODUCTION

1. This paper summarizes Norwegian views as they have been put forth in a number of written papers and oral interventions to the CES/OECD/Eurostat/World Bank Working group on Statistics for Sustainable Development (WGSSD).

2. A basic premise is that to understand sustainable development (SD), one has to have an analytical framework or theory that explains longer term development (LTD). Below, such a framework based on long standing research in development (growth) theory, environmental economics, and the human capital literature is briefly summarised in non-technical terms. Based on this framework we define key factors that may threaten the sustainability of LTD.

3. The measurement of whether LTD is sustainable or not follows from this framework. We show that main elements of a nation's capital stock, defined by statisticians as National Wealth (NW), can be estimated from national accounts (NA) and national resource accounts. For the non-market based aspects of a nation's capital or total resource base, some additional sustainable development indictors, SDIs, should be constructed in physical terms to complete a core set of SDIs for national policy making.

4. If all OECD (or CES) countries ensured sustainable long term developments in their respective countries, that would make a significant contribution to SD globally. However, national SD policies in developed countries should also contribute to SD in developing

countries -- especially the poorer ones. Thus we also give examples of SDIs that could be useful to guide national policies in developed countries policies to that end.

AN ANALTICAL FRAMEWORK FOR LTD AND SD.

5. Theories of LTD have been evolving over a long period of time going as far back as the seminal work of Adam Smith: "The Wealth of Nations" (1776), where a nations wealth was defined and discussed. David Ricardo introduced the concept of natural capital (NC) with special reference at that time to the importance of land. According to John Hicks: "Capital and Growth" (1965) these were the first two to develop classical growth- or development theories.

6. A crucial element in theories of growth or LTD is the notion of savings and investments. This was set forth clearly and rigorously by Frank Ramsey in his important article on: "A mathematical Theory of Savings", Economic Journal 1928. Economic Nobel Prize winner Robert M. Solow revived interest in growth and development theories in the 1950s, and his contributions to neoclassical development theory are summed up in: "Growth Theory: An Exposition" (1988).
The importance of human capital (HC) for development further refined the work of Solow an others, see Schultze and Becker and the empirical documentation in The OECD Growth Study (2003). The paper by Mads Greaker produced for the WGSSD: "National Wealth and the Calculation of the Human Capital Component" (September 2007) sums up the frontier of present research in this area and its importance for, inter alia, LTD and SD.

7. Natural capital (NC) was up to the early 1970s not seen as a critical element or threat to longer term sustainability of development by the neoclassical researchers. However, the book: "Limits to Growth" (1972), and perhaps the first oil crisis, raised exactly questions which in turn led to a large number of responses, notably by environmental economists, over the ensuing 35 years up to now. Both conceptually and regarding measurement, important works - among many others - have been:

- John Hartwick: "Intergenerational Equity and the Investing of Rents from Exhaustible Resources", American Economic Review 1977;
- Alfsen, Bye and Lorentsen: "Natural Resource Accounting and Analysis. The Norwegian Experience 1978-1986", Statistics Norway 1987;
- Pearce and Atkinson: "Capital Theory and the measurement of Sustainable Development: An Indicator of Weak Sustainability"; Ecological Economics 1993;
- "Where is the Wealth of Nations? Measuring Capital for the 21st Century", The World Bank 2005.

This last publication presents Genuine Savings (GS) numbers for some 140 countries which now are yearly updated by The World Bank. Genuine savings is a broader concept of savings than in traditional national accounting including natural resources or capital and simple measures of human capital. The bottom line is that nations have to maintain or enhance their total resource base or capital stock to be on sustainable development paths in the longer term. According to these estimates some 30 of the mostly developing countries exhibit negative genuine savings and are thus reducing their resource basis for the future. Without such knowledge, and looking at GDP which can be boosted in the short term by drawing down this capital base, policy makers are mislead about LTD and SD. Thus GDP, while useful for short term policy purposes, is <u>not</u> an indicator of sustainable development, SDI.

8. Thus the state of the art in 2007 tells us the analytical framework developed over more than 200 years can be summed up in non-technical terms thus: LTD = RFC + HC + NC + SC + TC where:
LTD = Long term development,
RFC = Real and financial capital
HC = Human capital,
NC = Natural capital,
SC = Social or institutional capital, and
TC = technological change.
Standard definitions of accounting, see SNA (1993), Eurostat (2001) and SEEA (2003) are that a nations total resource base or National Wealth,
NW = RFC + HC + NC + SC.

9. We therefore now have a model or analytical framework of LTD clearly defined and can thus specify threats to its longer term sustainability (SD):

- a necessary condition for SD is that NW in real terms pr capita is preserved or non-declining over time, see SEEA 2003, page 4;
- a sufficient condition for SD is that none of the individual capital components, notably NC or the stock of natural resources, are reduced below critical or irreversible levels.

MEASURING SD: A CORE SET OF SDIs

10. This analytical framework assumes that NW ideally should be comprehensive, that is NW should encompass all types of capital that contribute to development and wellbeing.

11. As described in more detail in the paper by Greaker op. cit., there exist standard or well established statistical methods and procedures for calculating NW. The methods used by Statistics Norway are described in some detail in the above mentioned paper by Greaker, and the reader is referred to this paper which has been presented to the WGSSD and sent to the Bucharest meeting in an updated and refined version. In short:

- the stocks of financial and real (RFC) capital are computed directly from national accounts (NA);
- the marked based part of natural capital (NC) is, cfr Eurostat (2001) and SEEA (2003) definitions of resource rents, found by computing resource rents for renewable and non-renewable natural resources bougth and sold in markets, see Greaker op. cit pages 4 and 5. Thus one gets two SDI`s measured in monetary terms for renewable natural resources such as fish, agriculture and hydropower, and from non-renewable natural resources such as oil and gas, mining etc.;
- the stock of human capital (HC) can be measured directly in a number of ways. The seemingly simplest alternative, using once more data from the national accounts, is to calculate the total value of the work effort as total hours worked as a whole times the average wage. The main part of Greakers paper shows how one can utilise more sophisticated methods;
- thus the marked based part of NW that can be measured in monetary terms is the sum of:
  - the present value of future resource rents from renewable natural resources; +
  - the present value of future resource rents from non-renewable resources; +
  - the present value of future contributions from human capital (HC) measured as defined in the third bullet above; +

- current value of fixed capital (RC) as given by NA + -Net financial wealth also taken from the NA.

We now have these four SDIs in monetary terms, and they can be added together to total market based or national wealth.

- The SEEA (2003) gives the following definition of natural capital: "Natural capital is generally considered to comprise three principal categories:natural resource stocks, land and ecosystems. All are considered essential to the long-term sustainability of development for their provision of "functions" to the economy, as well as to mankind outside the economy and other living beings. It is helpful to consider functions as falling into one of three groups:
  - resource functions;
  - sink functions;
  - service functions

  The resource functions should be covered by the estimates of marked based renewable and non-renewable natural resources and their respective SDIs as measured in monetary terms above. But as already underlined, one needs addtional SDIs measured in physical terms for the sink function and the service function.
  Such SDIs could vary from country to country according to the situation in that country. In Norway, national SDIs - based on the Norwegian Indicator Commission (2005) - in these areas are:
  - Sink functions
    - emission of GHGs compared with the Kyoto target (for Norway);
    - percentage of land where the critical level for acidification has been exceeded;
    - percentage of rivers and lakes with clearly good ecological status;
    - percentage of localities (costal waters) with clearly good ecological status;
    - household consumption of hazardous substances.
  - Service (Survival) functions:
    - terrestrial ecosystems (Population trends of resting wild birds);
    - irreversible losses of bilogically productive areas.

    National SDIs for the critical non-marked pased parts of NC could vary from country to country as these conditions in the various OECD/CES countries probably vary widely. The key is to find critical levels for these non-marked SDI`s.
- As already alluded to, the concept of social or institutional capital is less developed than the other main capital components, and methods differ. Nevertheless, there is probably some consensus that SC/Institutional Capital/Governance influence LTD. Again situations probably differ quite a bit between countries.
  In Norway one has chosen the following SDI: number of persons in working ages outside the labour force as a percent of the total population as around 20 per cent or one in five are on non-working benefits (disability payments, sickness benefits etc). This is seen as non-sustainable in the longer term both socially and economically, and regarding pensions systems and the longer term sustainability of government finances more generally.
  Here again, OECD/CES countries could chose one/a few SDIs in non-monetary terms most relevant for their country.
- The raison d`etre for national strategies and national policies to enhance SD are twofold in developed countries:
  - to contribute to SD in that country;
  - to contribute to SDI developing countries, and to SD globally.
- Developed countries can contribute to SD in developing countries, and thus indirectly to global SD, by - inter alia:
  - development aid/ODA;

- reduction of barriers to trade from developing/poor countries.

In Norway ODA as a percentage of BNI and trade with poor African countries complete the set of core SDIs, for national policy marking and the follow up of The Norwegian Strategy for Sustainable Development.

SUMMING UP

Recommendations to the WGSDS

12. An analytical model based on long standing research states that:
LTD is a function of RFC, HC, NC, SC and technological developments. I.e. a nations resource base, technological developments and how efficiently this resource base is managed over time determines LTD.

13. The total resource base according to statistical/accounting standards is called a nations wealth (NW), and NW is defined as RFC + HC + NC + SC.
We argue that:

- sustainable development requires that none of the main capital components, notably natural capital or natural resources, is reduced below critical or irreversible levels. Thus one needs estimates not only for total NW per capita in real terms, but also for the individual capital components - including physical SDIs for the non-market part of NC (Sink and Service functions) and SC.

14. This rigorously defines the domains of SDIs and for SD policies. The core set of SDIs for national policy making could be:

- All countries with a reasonably developed accounting/statistical system as in SEEA should compute the following five SDIs in monetary terms:
  Total NW, RFC, HC and the marked based renewable and non-renewable resource stocks according to the standard accounting/statistical networks described above.
- Compute in additione a few SDIs in non-monetary terms for the key non-market stocks of NC important for national SD policies. These could vary from country to country in the OECD/CES area, but SEEA (2003) should be used as a guide.
- Compute also a few key SDIs for SC in non-monetary terms that are key to a country's long term SD. These could also vary from country to country;
- Finally, a developed country's contribution to global SD could include a few indicators in physical terms for their contribution to SD in developing/poor countries. Even though e.g. ODA viewed in isolation reduces that country's NW in the short term, ODA could easily be seen as contributing to NW in developing countries and thus to NW globally. Thus it is consistent with our analytical model which looks at resources bases, both nationally and globally, and how they have to be sustained over time.
- These are a small set of national SDIs in monetary and non-monetary terms for national awareness and policy making in developed (CES/OECD). For more detailed analysis of key SD policies more detailed statistics and indicators are needed, as are models to aid longer term simulations and analyses.
- For SDI`s in developing countries, the starting point should by genuine savings (GS) estimates as presented each year by The World Bank.

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