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WEALTH ACCOUNTING IN NORWAY

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WEALTH ACCOUNTING IN NORWAY

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1. Introduction

A nation's broad capital base is termed its total national wealth. As understood, it should comprise all types of assets that facilitate the creation of human well-being, either directly or indirectly through generating consumption possibilities. Usually, total national wealth is partitioned into financial, produced, natural, human and social capital components.

There exist two broad ways to measure total national wealth – from the bottom up, i.e. asset by asset, and from the top down, i.e. relying on guidance from economic theory. If the accounting for assets from the bottom up is complete (i.e. no omitted assets), then the two measures of wealth should in principle coincide.

A recent example of bottom-up estimation is provided by Arrow et al. (2012); based on the same methodology, the first UN *Inclusive Wealth Report* (UNU-IHDP and UNEP, 2012) was compiled and released. The World Bank's work on comprehensive wealth accounting (World Bank, 2006, 2011) builds on the top-down approach, with total wealth measured as the present value of future expected consumption, as theory would suggest under the assumption of constant returns to scale.

In Norway, accounting for total national wealth followed a similar approach as applied by the World Bank. But the work was carried out only recently and occasionally (e.g. Aslaksen et al., 1990; Brekke et al., 1997; Lindholt, 2000; Greaker et al., 2005). On the contrary, accounting for the various capital components of national wealth, in particular, natural resources, has a long history in Norway.

Both works of natural resource and wealth accounting in Norway are closely related and are part of Norwegian exploration in seeking management tools for sustainable development. In this paper, an overview is given of Norwegian experiences during its long time endeavor in this field. The purpose is to summarize lessons learned and knowledge gained through this journey, and to identify possible gaps, with a view of proposing suggestions for future works.

The rest of the paper is organized as follows. Section 2 presents a historical review of the establishment and evolution of Norwegian natural resource accounts, as well as its characteristics and links with the Systems of Environmental and Economic Accounting (SEEA). In Section 3, discussion is around the feasibility and usefulness of green national accounts like 'Green GDP' indices in Norway. To facilitate the discussion, a bird's eye view is given on relevant literature and practices at the international level. Section 4 introduces the latest strategy and action plan proposed by the Norwegian government for constructing a set of key indicators for sustainable development. The method used for accounting for Norwegian national wealth is presented and commented as well. Section 5 concludes.

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2. Natural resource accounting

Norway is fortunately endowed with abundant natural resources of many kinds, such as fisheries, forests, hydropower, oil and natural gas. The wide exploitation of these resources, *inter alia*, energy resources, has contributed significantly to the Norwegian industrialization.

The rapid economic development, particularly after World War II, on the other hand, also resulted in noticeable pollution into air, water and soil, i.e. a deteriorated environment. To tackle this issue, and to address the growing international concern over 'Limits to Growth' (Meadows, et al., 1972), Norway, among the first in the world, established the Ministry of Environment in 1972.

The institutionalization of this new ministry is to seek suitable tools for managing natural resources and the environment from a long-term perspective. From 1978 Statistics Norway was assigned a task of developing natural resource accounts,[2] regarded as one of such important tools.

The natural resource accounts consisted of both stock ('reserve or capital') and flow ('extraction, conversion and trade') accounts, which are of crucial importance for management purposes. In addition, the 'end use' accounts allow one to trace who is going to be affected by a change of policy. The sectoral structure of these accounts followed the classification in standards stipulated for the Systems of National Accounts (SNA), facilitating potential integrated economic/environment modeling for policy analysis.

The Norwegian accounts initially covered a large number of natural resources and environmental issues, including energy, minerals, sand and gravel, forests, fish, land use, fresh water, air pollution and waste (the last two entities were treated as negative environmental resources). The accounts were in physical units, supplemented with price information whenever available.

By the mid-1980s it was found that most of the accounts were, however, under-utilized by the relevant policy makers, with energy account as the only exception (Alfsen et al. 1987). The fact that the latter was routinely and actively used was primarily driven by the demand. Steadily the economic modeling employed by the government has been integrating energy issues into economic analysis, for instance, by treating energy as a separate production factor, by modeling emission scenarios due to energy consumption, etc.

This has gradually led to a stronger focus on accounts for energy resources in Norway, together with the associated environmental issues such as air pollution. More generally, during the 1980s and 1990s, the focus of the Norwegian natural resource accounts has shifted from mismanagement of material resources to issues related to a deteriorating environment.

As a result, the forest, fish and land use accounts are continued on a minimum basis only, while the mineral accounts at present are discontinued. Although some detailed statistics are still produced for management purposes (e.g. forest), the structuring of them into sectoral 'reserve', 'transformation' and 'end use' accounts is abandoned.

However, the momentum trying to integrate economic- and environment-related statistics into a cohesive accounting system sustained at Statistics Norway (see e.g. Sørensen, 2000 and Hass et al., 2002a).

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[2] Statistics Norway is responsible for national accounting as well as the development and operation of some of the economic planning models employed by the government. Coordinating natural resource accounting with ongoing work on tools for economic planning will ensure a good communication within the government (e.g. between the Ministry of Finance and the Ministry of Environment). In addition, Statistics Norway has statistical expertise and access to primary data, both needed for constructing natural resource accounts.

Moreover, it was claimed that at least some of the Norwegian experiences during the earlier years have had an impact on the development of SEEA (Alfsen and Greaker, 2007). And indeed, during the revision process that leads to the latest SEEA 2012, the Oslo Group on Energy Statistics was also involved in the discussion of issues pertaining to energy.

3. Applicability of 'Green GDP'

At the international level, reflections on the 'limits to growth' initiated since early 1970s has brought about a large literature discussing whether unchecked economic growth with finite supply of non-renewable resources would eventually mean doom (e.g. Dasgupta and Heal, 1979). The literature culminated in the seminal work by Hartwick (1977), which states that constant consumption over time is achievable if the resource rent from depletion is entirely invested in physical capital, a so-called Hartwick's rule.

Solow (1986) illustrates formally that the Hartwick's rule implies maintaining aggregate wealth at a constant level over time. Brekke (1997) demonstrates that for a small open economy like Norway with access to a perfect capital market, non-declining wealth is consistent with sustainable consumption.

Meanwhile, the publication of the highly influential report *Our Common Future* by the World Commission on Environment and Development (WCED, 1987) has brought the notion of 'sustainable development' onto the priority agenda of international politics arena. Echoing the call from this report, researchers from both academic communities, national governments, and international organizations came around to construct various indicators purporting to monitor and implement sustainability.

Some have chosen indicators in a more or less ad hoc manner and thus without any underlying unifying framework;[3] while some others attempted to work out a single or a few highly aggregated indicators by applying theoretical advancements achieved in this field.[4]

Within the second category, Pearce and Atkinson (1993) is an early contribution by directly applying Hartwick's rule to national accounts numbers for 18 different countries. Later, the World Bank developed and published an indicator called 'genuine savings' for as much as 140 countries, including both developed and developing ones (Hamilton, 2000; World Bank, 2006).

In a similar way, many experiments intended to 'greening' national accounts, *inter alia*, to adjust GDP for the degradation of environment and/or depletion of natural resources, in order to derive an environmentally corrected GDP number (see e.g. Harrison, 1989; Hartwick, 1990; Mäler, 1991). Norwegian investigations and discussions around this topic include Aaheim and Nyborg (1995) and Alfsen (1996).

The idea of a 'Green GDP' is intuitively appealing and conceptually attractive. At least on the face of it, adjusting GDP for the degradation of environment and/or depletion of natural resources seems to be similar with the calculation of net national product, i.e. adjusting GDP for the consumption of produced capital. The implementation of a 'Green GDP' in Norway was, however, deemed to be impractical for a number of reasons.

First of all, adjusting GDP for changes in the state of environmental assets would face daunting challenges, among which, evaluating environmental assets (such as ecosystem) in monetary terms is very hard. As well known, environmental assets are not traded in any market, and for them costs are hard to

[3] A good summary of these and similar indicators is in Hass et al. (2002b).

[4] For a short survey of these indicators, please refer to World Bank (2003) and Alfsen and Greaker (2007).

account for; due to their uniqueness, it is also difficult to find similar assets that are traded in market with needed price information available. [5] However, such valuation is absolutely essential when adjusting GDP for changes in the state of environment.

For local environmental issues, various approaches (e.g. 'willingness to pay', 'willingness to accept', 'cost of abatement', etc.) can be applied for evaluation purpose. But there is no guarantee that these different approaches would lead to the same or similar results, making adjusting GDP unsatisfactory.

Further, from a general equilibrium point of view, some large environmental initiatives intended to address regional and even global environmental issues may impact the whole economic system in all, and thus the traditional GDP itself should be adjusted as well under such circumstances, which is not an easy task.[6]

It is tempting to hope that fewer problems may emerge when adjusting GDP for the depletion of natural resources, such as oil and natural gas in Norway, because most of oil and gas produced in Norway are exported and traded in the international market.

Brekke et al. (1989) estimated the oil wealth as the discounted present value of future returns, based on official government price projections published in various contexts. They found that the year-on-year changes in the oil wealth essentially were due to changes in price expectations alone; for several years the changes even exceeded the actual GDP for Norway. Thus, adjusting GDP for oil depletion is not satisfactory either.

Besides the evaluation difficulties, perhaps more important, from policy makers' perspective, making policy that addresses issues related to sustainable development is a task more difficult than that of assessing a single indicator like a 'Green GDP'. The information needed here is much more than a single indicator could convey.

Furthermore, a single indicator often makes it difficult to judge how individual areas of importance for sustainability have been weighted and aggregated. This uncertainty tends to reduce confidence and usefulness in relying on such aggregated indicators only.

To summarize, a single indicator like 'Green GDP' contains definitely less information than an accounting system like national resource accounts or SEEA. But attempting to measure almost all aspects related to sustainability seems to be liable to lose focus on critical issues for sustainable development. Therefore, a balance has to be struck between these two extreme options.

4. Towards constructing a set of key indicators for sustainable development

In 2002, Norway finally set out to formulate both a strategy and an action plan for sustainable development (Ministry of Foreign Affairs, 2002; Ministry of Finance, 2003). To develop a limited and focused set of indicators for sustainable development in Norway, a commission was established to put

[5] On the contrary, GDP is derived from national accounts, in which, valuations are mostly done on the basis of market prices. In the absence of market price information, valuations are made according to costs incurred (for instance, non-market services produced by government), or by reference to market prices for analogous goods or services (for example, services of owner-occupied dwellings).

[6] As a matter of fact, to assess this profound impact, usual accounting work is not sufficient. It requires a modeling approach to analyze the complicated interrelationships within the economy, and indeed, between the economy and the environment.

forward a proposal for such a set. As a result, a report entitled '*Simple signals in a complex world*' was delivered in 2005 (NOU, 2005).[7]

To create a unifying framework, while at the same time keeping the indicators as intuitively understandable as possible, the report suggested basing the indicator set on National Wealth as the key-unifying concept. According to this so-called 'capital approach', sustainable development should focus on securing the total resource base of a country (considered as the total national wealth), thus protecting development options, rather than preserving some particular development pathway, for the future.

The definition of national wealth used in the report is broader than it has been traditionally used at Statistics Norway and understood by national accountants. While the latter conventionally refers only to the monetary value of the produced, esp. fixed assets in an economy, the new definition includes not only assets that have market values, but also natural and environmental resources that can not be easily valued in monetary terms (see e.g. Moe, 2007; Alfsen and Greaker, 2007).

Moreover, the report recommended that some natural resources should be reported both in physical and monetary terms, which implies a step towards the adoption of the criterion of strong sustainability. The reasoning is that even if the monetary value of total national wealth is increasing, an economy is still running a risk of being on a non-sustainable development path, if these critical natural resources are seriously depleted beyond a threshold/minimum level. One example of these critical natural resources is the ecosystem providing ecological functions that are not replaceable.

In order to work on a common framework based on the capital approach for indicators for sustainable development among countries, Statistics Norway and the Norwegian Ministry of Finance have given financial support to the Joint UNECE/OECD/Eurostat Working Group on Statistics for Sustainable Development (WGSSD) for their research works, and to the Editor of an inferential UN report, delivered by this group in 2009 and entitled '*Measuring Sustainable Development*' (UNECE, 2009).

As shown in a first Norwegian version of a set of key indicators for sustainable development (Alfsen and Greaker, 2007), monetary value of national income from different components of national wealth is one essential indicator within the set, therefore, the calculation of monetary value of total national wealth is of crucial importance.

In 2005 Statistics Norway calculated Norwegian national wealth per capita for the period 1985-2004, by using statistics from both the national accounts and the natural resource accounts (for fisheries, forests, oil and natural gas) (Greaker et al. 2005). The calculation was in monetary terms, thus implicitly assuming full substitutability among the calculated capital components, i.e. an assumption of weak sustainability. The calculation consists of three steps.

First, resource rents from both renewable resources (fish, aquaculture, forestry, agriculture, hydropower, etc.) and non-renewable resources (oil and gas, mining, etc.) are calculated. The resource rent is defined by Eurostat (2001) and SEEA 2003, and can be best considered as the surplus value accruing to the extractor or user of a natural resource, calculated after all costs and normal returns have been taken into account.

[7] A summary in English can be found in Ministry of Finance (2005).

(1) Resource rent = Basic value of output/production
– Intermediate uses
+ Taxes on products
– Subsidies on products
– Non-industry specific taxes
+ Non-industry specific subsidies
– Compensation of employees
– Return on fixed capital
– Capital consumption

As a second step, net national income for any given year is decomposed as follows:

(2) Net national income = Resource rents from both renewable and non-renewable resources
+ Net return on fixed capital
+ Net income from financial wealth
+ Return on human capital

Recall that resource rents are calculated from the first step. Net national income and net income from financial wealth are directly from the national accounts, so is the value of fixed capital. Based on the assumption about the average rate of return to capital, net return on fixed capital can be derived. Finally, the return on human capital is calculated residually:

(3) Return on human capital = Net national income
– Resource rents
– Net return on fixed capital
– Net income from financial wealth

The final step is to calculate the national wealth as the following:

(4) National wealt = Present values of future resource rents from both renewable and non-renewable resources
+ Present value of future contribution from human capital
+ Current value of fixed capital
+ Net financial wealth

The last two items in Equation (4) are directly given by national accounts. Calculation of future resource rents is based on predictions on future prices and extraction paths from natural resource accounts and other statistical sources. The assumption made for human capital contribution is that this year's contribution is prolonged infinitely into future.[8]

The calculation results indicate that Norwegian national wealth per capita has been steadily increasing during the observed years; while the value of the non-renewable resources is declining. The value of financial wealth is increasing, which is in accordance with the public policy as resource rents are reinvested in foreign financial assets by the Norwegian government. Most important, the major driving force behind the growth seems to be the human capital component.

[8] For more detailed methodological and technical assumptions, please refer to Greaker, et al. (2005).

As mentioned in Introduction, the method applied by Statistics Norway to account for total national wealth falls into the same category as applied by the World Bank (2006, 2011). The current method, however, has some drawbacks.

First of all, the coverage of natural resources is far from comprehensive, for instance, ecosystem services, natural amenities, land are out of the scope of the current analysis. The main reason is that price information on such resources is missing and/or difficult to be estimated (cf. Section 3).

With improved knowledge and statistics, it can be expected that new types of resources may be gradually included in the measurement. To this end, the newly formed OECD/Eurostat task force on non-financial assets could serve as an important source of knowledge.

As the second drawback, uncertainties around the prediction on future prices of natural resources are considerably high. It has been found that in some cases the uncertainty as to future oil prices is so large that adjusting GDP for changes in the oil wealth renders the traditional GDP measure virtually irrelevant (Brekke et al. 1989).

Since an in-house model at Statistics Norway has been used for predicting future prices for oil and gas in the international market, the work on the improvement of this model is worth pursuing.

As the third drawback, due to high subsidies on products, the resource rents for some renewable resources such as fisheries and agriculture are negative, as calculated based on national accounts data. However, by using other method and based on more detailed data, some experimental exercises have given different results, which indicates the potential possibility for improving the resource rents calculation for these renewable resources.

The fourth drawback is that the most important component, human capital, is calculated as a residual, which is unsatisfactory. Because this residual measure will definitely be affected by measurement errors in all the terms entering the accounting identities, resulting in potential biases in the final estimate of human capital, and ultimately, that of total national wealth. Even further, the residual method cannot explain which factors are the driving forces behind the evolution of human capital over time.

An obvious way to improve on the residual method is to measure human capital directly. By applying the lifetime income approach (Jorgenson and Fraumeni, 1989, 1992a, 1992b), Liu and Greaker (2009) measured the stock value of human capital for Norway in 2006, on the basis of data available at Statistics Norway.

In fact, there already exist many national studies trying to directly measure human capital.[9] And the results from the recent OECD human capital project have shown the feasibility of applying the lifetime income approach for measuring human capital for a number of countries (Liu, 2011, 2013). The OECD work has paved the way for further research along this line, a significant step towards making guidelines for measuring human capital by national statistical offices in the future.

In addition, an attempt has also been made in Hamilton and Liu (2013) by incorporating the direct measure of human capital from the OECD work into the World Bank's framework of comprehensive wealth accounting. The preliminary results have clearly shown the promising prospect for future works following this direction.

[9] A survey of country practices and international initiatives in this field is provided in Boarini, et al. (2012).

5. Conclusions and future work plan

In conclusion, it seems that the central theme following Norwegian exploration from natural resource accounting through discussion of applicability of 'Green GDP' to proposing a set of indicators for sustainability is its long time efforts in seeking management tools for sustainable development.

In terms of relevance for policy making, the ambitious Norwegian natural resource accounts were under-utilized, despite of its large coverage of natural resources at its early stage. The trend from demand side has shaped the development path for natural resource accounting, leading to a shift of focus from mismanagement of natural resources to environmental issues.

As for policy making, too much emphasis on as much information as possible may not be practical since it may blur the focus on the critical issues related to sustainable development. On the other hand, relying on single indicators only may not be practical either, since it will lose key informative statistics needed for policy decision.

A sensibly practical way may exist between the two extreme ends of option spectrum, i.e. to find a selected set of key indicators, as proposed by the Norwegian government. The set should comprise indicators derived from SEEA and the SNA, following a unified framework based on the concept of total national wealth.

As the value of total national wealth ought to be one of the core indicators within the selected set, to improve the current methodology for measuring its monetary value at Statistics Norway, some suggestions for future work are given as follows.

- Incorporating land into wealth accounting, in recognition that the OECD/Eurostat task force on non-financial assets is currently focusing on land; and that Statistics Norway is trying to include land value into the balance sheet accounts (Table 26), to be reported to Eurostat soon.
- Strengthening cooperation between different units at Statistics Norway (Research Department, Energy Statistics Division, and National Accounts Division), with the view of improving the price information to be employed in natural resource accounting.
- Encouraging the implementation of more experimental exercises on calculating resource rents for some renewable resources, starting from fisheries that have relatively better quality of data.
- Assimilating up-to-date results generated by research advancements and implementation practices from international community in respect to the latest SEEA, to enhance the work of wealth accounting in Norway.
- Supplementing the wealth accounting with direct estimates of human capital, following the work initiated by Liu and Greaker (2009) at Statistics Norway.
- Following research outcomes of a newly established UNECE task force for constructing human capital satellite accounts, in order to, for instance, account for non-market effects of human capital investment.

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