

Session Number: 8B - Group 1
Session Title: Contributed papers
Paper Number: 1.4
Session Organizer: Edward Wolff
Discussant:

*Paper Prepared for the 26th General Conference of
The International Association for Research in Income and Wealth
Cracow, Poland, 27 August to 2 September 2000*

ENVIRONMENTAL ACCOUNTS IN NORWAY

Knut Ø. Sørensen
Division for National Accounts

Statistics Norway

For additional information please contact:

Author Name: Knut O. Sørensen
Author Address: POB 8131 Dep, N - 0033 Oslo
Author E-Mail: knut.o.sorensen@ssb.no
Author Fax: +47 22864996
Author Telephone: +47 22864507

This paper is placed on the following websites: www.stat.gov.pl
www.econ.nyu.edu/dept/iariw

Environmental Accounts in Norway.

1. Summary

The start of environmental accounts in Norway.

The movement for nature conservation has old roots in Norway. Environmental issues, as a major concern for the population in general and Norwegian economists in particular was evident around 1970. In 1971 the oil extraction from Norwegian continental shelf started. The Ministry of Environment was formed 1972. Analyses of emissions to air and consequences of the future oil economy had a prominent place in the Government Long-term programme 1974-77. The Ministry of Environment commissioned resource accounts for most Norwegian natural resources. The period culminated in the early 1980s, offering a wide range of resource accounts and model tools for environmental analyses.

The interim period

In the period 1985 - 1997 the analyses of emissions to air continued. Emissions were projected and analysed with the help of the general macro-economic models of the period, a type of applications that still are frequent. Related to the emission analyses, the energy accounts were continued and developed. The physical resource accounts was however, in several cases stopped, and for other resources done with less details and with lower level of ambition than in the early period.

The recent work with environmental accounts. The NOREEA project.

The NOREEA project started in the summer 1997. The project has been developed in three directions:

- National Accounts Supply and Use (SUT) tables were combined with emissions to air in the NAMEA- type format.
- Test estimates of resource wealth for oil and gas, forest and fish.
- Accounting projects covering green taxes and environmental protection expenditures.

The work with emission accounts has revealed some harmonisation problem in the coverage of emissions, which is also reflected in the different reporting systems. Also there are an awareness of the need for harmonisation between the energy accounts in physical units and the national accounts, this harmonisation has proved difficult to maintain.

The estimates of resource wealth are related to development of capital accounts for these resources and the question of 'greening' of National Accounts estimates. While oil and gas wealth is important, no resource rent has been estimated for fish. The discussion for forest wealth is also linked with the question of cultivated vs. non-cultivated forests. We conclude that most of the timber fellings come from cultivated forests, a position that was held also in the early 1950s, but later abandoned.

The green taxes project uses the structure of the Norwegian National Accounts. We have integrated SUT tables in all value sets, so most green taxes can be identified in the existing tables. In some cases, however, more details in the product classification and the tax structures would improve the quality of the results.

2. Norwegian dependence on natural resources.

Norway is still a country heavily dependent on natural resources. Crude oil and gas dominates the exports (1999: 1/3 of total exports). Fish and fish products are next to oil as export products. A large part of the Norwegian manufacturing industries is using hydroelectric power and/or domestic resources, such as metal processing and pulp and paper industries.

The environmental movement in Norway can be traced back to the years shortly after 1900. The first Non-Government Organisation for nature conservation dates back to 1914. The early environmental movement was mainly concerned with nature conservation. The popular support was, however, rather modest until the late 1960's (NOU 1980:23). The classic concern for nature conservation still leads to conflicts such as hydroelectric power development vs. waterfall preservation, husbandry vs. keeping predators etc. Despite the present interest for biological diversity and environmental services, environmental accounting covering these aspects is not firmly developed, at least not in Norway. Pollution problems have been extensively analysed, and are also central to the NOREEA (NORwegian Environmental and Economic Accounts).

Turning to nature considered as resources and assets, there is the traditional balance between efficient use of the natural resources and the fear of over-utilisation and depletion. Through history, the press for efficient use of natural resources has triggered technical progress that created the need for regulation of extraction and use. Sustainability has been a concern in these regulations, but not the only one.

An early example of technical progress in Norway was the introduction of water-driven sawmills (from ca. 1500 onwards). The efficiency of producing building materials from timber increased dramatically. The Danish-Norwegian kings in the 1600's enacted restrictions and regulations for forestry. Although these first regulations had little effect, forestry today is thoroughly regulated and the forests are expanding.

Other examples can be found from the Norwegian concession legislation for waterfalls regulating the electricity production and the technical progress in fishing matched by detailed regulation.

The former whaling activity of Norway can be an example of technical progress that was not in time matched by regulations.

Environmental accounts should be a source of data suitable for those the analyses of efficient use of the resources as well as for the study of depletion and pollution.

3. The rise of environmental accounting in Norway.

It is hard to find references to environmental issues in the old Norwegian economics literature. In the very first formulations of the national accounting system, there was an entry for changes in the stock of standing timber in the forests. The stock of timber was considered to be a produced asset, and the change in stock was investment in inventories (Statistics Norway, 1952). Later, it was considered investment in fixed capital (Statistics Norway, 1968). From the major revision following the SNA68, changes in the stock of standing timber was no longer considered a produced asset. However, from 1985, the capital stock in forestry included the value of standing timber. This series was updated until our last major SNA93 revision. Now we are reintroducing timber (partly) as a produced asset, along the lines of the very first formulations of National Accounts in Norway.

Around 1970 there was a marked increase in the interest of both the general public and economists for environmental issues. One of the best-known cases of civil disobedience in Norway was the protest to hydropower development in Stilla in the north of Norway. This case was hotly debated in Norwegian media in 1968. The interest in natural resource questions was aroused by the discovery of oil on the Norwegian Continental shelf in the late 1960's. Oil extraction started in 1971.

Towards the end of the year 1970, several articles about environmental issues, mainly centred on emissions, appeared in the Norwegian journal 'Sosialøkonomen' (the economist's journal). During the next year there were articles about environmental economics in every one of the monthly issues. From the start of the oil era, economists, including those of the Research Department of Statistics Norway, worked with oil analyses from several points of view. Studies of oil prices and supply and demand for petroleum products, price projections etc. were central elements. And there were analyses of how the oil activities could be absorbed in the Norwegian economy, the consequences of using the oil incomes etc.

In 1971 a commission on Norwegian Natural resources was presented (NOU 1972:1). Based on recommendations from this commission and from a general evaluation of government organisation and the general political interest, the Ministry of environment was organised in 1972. The first minister, Mrs Gro Brundtland, proved to be very energetic and became one of the strongest political leaders in Norway. The environmental issues were a major ingredient of the political campaigns for the general elections 1973. The Government's long term programme 1974-77 had a large separate analysis of the oil economy and the environment.

A report from Statistics Norway from this period (Peskin, 1972) advocates a version of environmental accounts similar to the present NAMEA tradition. Peskin suggested that a new statistical unit should collect emissions and energy products measured in physical quantities. Then the data should be introduced into the data matrices of the regular national accounts. The National Accounts Division would then have the responsibility of producing harmonised and consistent data sets, including the emissions and physical data.

While Peskin wrote his recommendations, the statistical office of the Employers Association was already establishing the first data set for emissions. The Research Department of Statistics Norway was enthusiastic, and adapted their models to include emissions. Model developments have paid much attention to a better representation of energy use and petroleum economics. In taking up the responsibilities of updating the models etc, the Research Department undertook much of the work that was suggested for the National Accounts Division. A separate unit for environmental statistics was established in 1978. This unit developed a set of resource accounts and developed data for emissions to air in close connection to the energy accounts. The National Accounts Division did not take up environmental accounting until 1997, starting the NOREEA project.

4. Establishment of resource accounts and emissions to air.

From the start, the new unit for environmental statistics centred on energy and emissions accounts. The energy accounts showed the use of energy by energy product in physical terms. This was a further development of the existing energy balances, redistributing energy use in activities such as transportation to the industry undertaking the activity. The resultant energy account has a much closer connection to the way these activities are handled in the national accounts. The emissions (to air) are to a large degree modelled from the use of petroleum products, but with information about point sources added from the reports to the Norwegian Pollution Authority. These energy and emission accounts still are the basic activity of the environmental statistics unit.

The strong interest in environmental issues made it possible for the new statistical unit to expand. The new Ministry of Environment commissioned accounts for an increasing number of natural assets, with an intention to cover all resources. At the heyday of these accounts, in 1982, Statistics Norway published the following accounts:

- Energy accounts
- Emissions to air
- Fish accounts
- Forest accounts
- Mineral accounts covering oil, coal, chalk, quarts, sand and gravel.
- Metal accounts, covering lead, iron, aluminium, magnesium, copper, zinc and nickel.

These accounts went far beyond statistics for the size of and changes in the relevant stocks. They also covered the supply of the commodity (production/ extraction, imports) and its uses throughout the economy, covering extraction activity, use in processing industries, and in some cases final uses of the processed products (exports, consumption etc) as well. The resource accounts emphasis was consistently with physical units.

The accounting efforts declined in the middle of the 1980's this. Apart from the energy and emission accounts, a few other accounts (fish, forest) have survived as summary tables on stocks and changes in the stocks. This development was summarised in Alfsen et. al. (1987). The reasons for the decline of the accounting activities are listed as:

- The Ministry of environment, commissioning the accounts, was not given the responsibility for the management of the resources. Once the accounts were published, the Ministry ended up with no particular use of updated accounts. The managers of the resources had their own information collection systems and did not need the accounts to do their work
- The fear that resources should be quickly used up, which had much publicity in the early 1970's, proved to be less pressing than first thought.
- Not all the accounts developed were considered to be very important.
- The costs of maintaining and developing the accounts further were higher than expected.

If we look at the accounts that survived the decline of environmental accounts, energy and emissions to air, there seems to be two kinds of reasons why these areas managed to keep their interest and funding. One reason is that the Ministry that started the analyses also had a clear responsibility to fight pollution. The popular interest was more steady with emission questions than with the supply of natural resources. Also, the link to the economic planning models supplied a powerful tool for analyses and planning that has been used to a large extent. The links to the planning models provided opportunity for projects and policy analyses, such as analyses of the effects of energy taxes, the effect of the oil economy for the economy, etc.

5. Recent work on environmental accounts within Statistics Norway

When the first surge of interest in environmental accounts reached Norway, the National Accounts Division was busy introducing the SNA 1968 revision. Then again in the 1990's interest among the national accountants in Norway rose. The SNA93 pays some attention to natural assets, and was accompanied by the SEEA 'preliminary' manual and pressures for 'green' national accounts. The establishment of the London group of environmental accounting and the large UN conference for environmental accounting in Tokyo 1996 created interesting new international fora for discussing the links of the environment and the national accounts. When this international interest rose, the National Accounts Division of Statistics Norway again was struggling with a revision of national accounts, this time the SNA93/ ESA95 revision. From 1997, however, the National Accounts Division has taken up the project NOREEA (NORwegian Economic and Environmental Accounts). This project has been developed in close co-operation with the Division for environmental statistics (Hass and Sørensen (1998)).

The work with this project has taken three different directions. The start of the project was to develop an integrated version of the Supply and Use tables of the national accounts and the emission accounts, roughly along the lines of the Dutch NAMEA. Then preliminary asset accounts for natural assets were prepared. Finally, we have begun looking into green taxes and environmental expenditures.

For the integrated economic and emission accounts, we should like to have a wider coverage of environmental issues. From the start we had a good coverage of emissions to air. The structure of the Norwegian national accounts and the emission accounts were well suited for this purpose. The existing structures made it possible with a quick start for our NOREEA. Further developments are considerably more difficult. The present plans are to cover emissions to water and generation of solid waste as well. Our problems are to a great extent related to the level of detail possible for the emissions to water and the solid waste. Much of the data available originates at treatment points, where the sources of the emissions are difficult to trace.

Our work with non-produced assets covers oil and gas, forests and ocean fish stocks. The most important asset is clearly the oil and gas of the North Sea, and this is the asset account that is most developed. For the forest accounts, the issue has been mainly to discuss to what extent the Norwegian forest should be classified as a cultivated asset. This is a question for the regular National accounts as well, and not only related to environmental accounts. The solution that seems most relevant today is quite close to the position taken in the first National Accounts of the 1950s. We are, however, allowing for a percentage of the timber coming from uncultivated forests.

The fish accounts shows that the fish wealth is negligible, very much in contradiction to the public (and fishermen) opinion. The period for our test calculation was a difficult period for the fishing industry, and the problems showed up as low operating surplus. Earlier estimates also show small or missing observed resource rents. This seems to be a result of the Norwegian regulations, giving priority to settlement policies for the coastal areas. Several researchers have identified wealth from the fish stocks, given some sort of optimal organisation of fish catches. Yet, we think the resource wealth should be a question of the yields actually realised. So, as long as the fishing activities does not give a rent beyond a normal return to capital and allowance for labour, we tend to conclude that there is no resource wealth from the fish stocks.

The Norwegian National Accounts has a detailed treatment of taxes integrated with the supply and use structure. We have used this for investigating the green taxes. However, reliable results for green taxes demand even more details in the national accounting material. Even though the taxes are included in the National Accounts, in some cases green taxes are aggregated with other taxes for the same product/ industry. Our accounting system allows to some extent for tax rate differentiation among different users of a product. Yet, in some cases, better quality of the estimates for green taxes would require a more detailed product classification.

For the year 1997 we made a pilot survey of environmental expenditures in manufacturing industry. It is still too early to tell the final destiny of the survey. Probably some main figures may be a permanent part of the structural survey for manufacturing industries. The figures for manufacturing industries can to some extent be supplemented by environmental expenditures of other kinds. Our aim is to develop this part of the project into a set of accounts of the SERIEE type.

6. Some issues from the environmental accounting

6.1 Harmonisation issues

One of the aims of the environmental accounts is to supply data for analyses of the economy and environment. So, it is important to harmonise the concepts and classifications used for the economic and the environmental data. In particular, the units of observation should be harmonised. This is, however, difficult to achieve in practise. An example is the energy accounts, which are crucial not only for energy analyses, but are also the basis for emissions to air accounts. While the activity classification of the national account is the Local kind of activity unit, the energy accounts, as in The CORRINAIR system, or in energy balances of IEA, has a classification of energy using activities. So, while transportation in the National accounts are establishments specialising in transportation activities, transportation in SNAP/CORINAIR includes transportation activities for establishments in wholesale trade etc. Emissions to air in the CORINAIR reporting system relates to the transportation activities of all industries, not to all activities in the transportation industry. In order to handle this difference properly, we need a cross-classification of energy using activities by industry. Such a cross-classification is provided by the Norwegian energy accounts, and gives the basis for NOREEA.

In general, the emission statistics, the agreements regarding emissions etc do not have the same coverage as the national accounts. From our results so far, we would mention the importance of emissions from (international) ocean shipping. This activity gave rise to 66,8% of total CO₂ emissions from transportation industry (NACE 60-63) in Norway 1996, and 96,8% of SO₂ emissions. Yet, emissions from ocean transport are not included in many data sets of emissions to air. International reporting and agreements most often exclude these emissions. For the National Accounts department it seems obvious, that if the ocean shipping is to be included in the domestic product, the emissions from this activity should be included in domestic emissions (see Gravggaard (1998)). Domestic emissions are then emissions emanating from domestic activities in the national accounts sense, while, for local emissions, we could have a concept national emissions for emissions experienced on the national territory.

While airborne emissions long have been a concern in Norway, it is not obvious that present accounting gives a good picture of the difference between these domestic and national concepts. In case of ocean transport, the emissions would be domestic emissions, but for a large part not national. It is not obvious that the distinction between ocean and coastal shipping used in emissions statistics coincides with the conventions of the national accounts. A similar comment would apply to air transport.

It is possible to develop this idea into estimating several different performance measures, each adapted to particular agreements etc. So, the Kyoto agreement could be represented by a Kyoto emission account, together with accounts for Kyoto emission permits. The Kyoto emission account could then mirror the particular regulations for forestry and exclusion of ocean transports etc, while the permit account could show the extent that the emissions were covered by permits etc.

6.2 Uncertainty and instability of wealth estimates

Of the three types of natural resources that are included in the NOREEA, only forests have a good quality measurement of the physical basis. The stocks of wild fish are not well known, let alone the development of these fish stocks with or without catch. The physical basis of the Norwegian petroleum resources is better known, but were totally unexpected as late as the mid-1960s.

For the three types of assets there is much fluctuation. For the petroleum wealth and the forests, these price fluctuations are the main source of change in the wealth estimates. A well-known figure exists, showing estimates for Norwegian petroleum wealth as reported in various official documents (Aaheim and Nyborg, 1995). This figure shows changes in the oil wealth from one year to the next that is comparable in size to the total GDP. The implications for the various 'green' NDP measures are not obvious. It points to the fact, however, that it is very important to have good procedures to handle revaluation as a source of change in the oil wealth.

Consider the 'green' version that deducts depletion of the natural resources analogous to depreciation of produced capital. As shown in Hill and Hill (1999), the adjusted NDP shall not normally be less stable than the traditional NDP measure. Sharp price increases shall cause increases in the value of extraction as well as depletion, so that the net result is likely to be more stable than the extraction itself.

6.3 Greening of the GDP?

Statistics Norway is, along with most other statistical offices, sceptic to the idea of adjusting gross or net domestic product to obtain 'greener' national product. The Norwegian view has been presented several times, and may be found in Alfssen(1996) and Aaheim and Nyborg(1995).

One reason for the scepticism is the idea sometimes given that the revised NDP measures can illustrate a sustainable economy. In our view, a sustainable economy could be quite different from the observed one. If so, a picture of the sustainable economy demands careful modelling of the alternative situation, and cannot be arrived at by a simple deduction in the net income figures.

Neither is it obvious that NDP shall be a good measure of welfare, green or not. Much of the criticism of NDP is also too simplified and misleading. Even with green adjustments, this will probably be the case also for the adjusted figures.

The Norwegian experience shows that one can go a long way into analyses of damages from emissions, deterioration of environmental qualities etc., without the use of 'green' domestic products. For many types of analyses, the adjusted NDP is simply not needed.

To these matters of principle, is added the complexities of estimating the 'green' elements. The national accounts need practical, well-documented, simple and transparent methods of estimation for which there is broad international acceptance. Today, such an acceptance exists mainly for estimating depletion of subsoil assets. Value estimates for degradation of the qualities of environmental services are debated, and various procedures may give very different estimates, depending on the particular aspects in focus.

This does not imply that estimates of environmental degradation and damages caused by pollution etc should not be undertaken. On the contrary, such estimates should be done and their implications discussed. This is possible without corrections to national accounts aggregates.

Much of the critical questions to the need for 'green' national accounts aggregates are relevant for the need of the traditional NDP as well. So, it incorporates debatable estimates for non-marked activities

(including illegal activities), there is questionable correspondence to welfare measurement, and most economic analyses could be done without the use of NDP. Should we then try doing without GDP and NDP? I think few economists would suggest this. So, it is a case for alternative formulations, even though many problems remain or are unanswered.

As a personal view, I would say that focussing on 'green' NDP as opposed to 'regular' NDP is unfortunate. We should rather have in mind the task to give a best possible picture of the economy at large. Incorporating non-economic aspects in a satellite framework should cover the data needs for analyses of interlinkages with environmental, social or other non-economic activities that we want to study. We must be open towards the possibility, however, that the activities and incomes in particular parts of the economy may be better described than current practice allows. In my view, oil extraction activities are a case in point for Norway. A better picture of the income from oil extraction is given if depletion of the oil resources is handled in the production account. If so, a change to the NDP concept is a consequence. It is not obvious to me, that the adjusted NDP concept is green. It is simply an (improved) measure of NDP.

References

- Aaheim, Asbjørn and Karine Nyborg (1995): On the Interpretation and Applicability of a "Green National Product". *The Review of Income and Wealth*, vol 41, no.1, 57-71. New York.
- Alfsen, Knut (1996): A green GDP - Do we need it? *Economic Survey 1996* 1 33-39, Statistics Norway.
- Alfsen, Knut Torstein Bye and Lorents Lorentsen (1987): Natural Resource Accounting and Analyses. The Norwegian Experience 1978-1986. *Social and Economic studies* 65, Statistics Norway.
- Gravgaard, Ole (1998): Problems in Combining National Accounts and Environmental Statistics. Proceedings and papers, fifth meeting of the London group on Environmental accounting Fontevraud France, Actes IFEN, Septembre 1999.
- Hass, Julie and Knut Ø. Sørensen (1998): Environmental profiles and benchmarking of Norwegian industries. Results from the Norwegian economic and environmental accounts (NOREEA) project. In: *Economic Survey 1998*, 1, 28-38, Statistics Norway.
- Hill, Peter T and Robert J Hill (1999): A New Conceptual Approach to the Measurement of Capital Gains, Depletion and Net National Product. Discussion paper 99/9, School of Economics, University of New South Wales.
- NOU 1972:1 Bruken av Norges naturressurser. Prinsipper - Krefter - Problemer - Retningslinjer. Norge gjennom 10000 år. (The use of Norwegian natural resources. Principles - Forces - Problems - Guidelines. Norway through 10000 years. In Norwegian only). Universitetsforlaget 1971.
- NOU 1980:23 Naturvern i Norge (Nature conservation in Norway. In Norwegian only). Miljøverndepartementet 1980.
- Peskin, Henry M. (1972): National Accounting and the Environment. Artikkel 50, (in English only) Statistics Norway.
- Statistics Norway (1952): National Accounts 1930-1939 and 1946-1951. NOS X1 109, Oslo
- Statistics Norway (1968): National Accounts 1865-1960. NOS XII 163, Oslo