# Users and Uses of Environmental Accounts

## A Review of Select Developed Countries

WAVES

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Global Partnership for Wealth Accounting and Valuation of Ecosystem Services (WAVES)

Wealth Accounting and Valuation of Ecosystem Services (WAVES ) is a global partnership led by the World Bank that aims to promote sustainable development by mainstreaming natural capital in development planning and national economic accounting systems, based on the System of Environmental-Economic Accounting (SEEA). The WAVES global partnership (www.wavespartnership.org) brings together a broad coalition of governments, UN agencies, nongovernment organizations and academics for this purpose.

WAVES core implementing countries include developing countries—Botswana, Colombia, Costa Rica, Guatemala, Indonesia, Madagascar, the Philippines and Rwanda—all working to establish natural capital accounts. WAVES also partners with UN agencies—UNEP, UNDP, and the UN Statistical Commission—that are helping to implement natural capital accounting. WAVES is funded by a multi-donor trust fund and is overseen by a steering committee. WAVES donors include—Denmark, the European Commission, France, Germany, Japan, The Netherlands, Norway, Switzerland, and the United Kingdom.

One of the key objectives of WAVES is to help develop internationally agreed guidelines for ecosystem accounting. The work on this front is led by the Policy and Technical Experts Committee (PTEC), a multidisciplinary body consisting of experts in economics, environmental accounting, natural sciences, and policy from the World Bank, UNEP, academic institutions, and governments. In addition to methodology development, PTEC also leads work to compile evidence on policy applications of natural capital accounts and to develop training materials.

**Prepared by**

Robert Smith
Midsummer Analytics

# Table of Contents

## Introduction and Summary of Findings

This report summarizes the results of a review of the policy-related users and uses of the environmental accounts compiled in a select group of developed countries (see below). The countries reviewed were chosen on the basis of having long experience in the field and a broad set of environmental accounts. Most of the countries reviewed, but not all, were able to provide substantial information on users and uses. The information they provided is the basis of this report and, as will be seen, it is quite extensive.

The users/uses discussed here should not be taken to be exhaustive however. It is certain that users/uses exist in every country that were not uncovered for this report. The primary sources of information for the report were governmental officials (mainly statisticians) responsible for the compilation of the environmental accounts in the countries reviewed. It would be impossible for these individuals to be aware of every user/use of their environmental accounts, just as every user/use of official statistics in general is not known. Thus, the users/uses discussed here should be taken as a subset, perhaps small, of all environmental accounts users/uses in the countries reviewed.[1]

With the exception of Mexico,[2] developing countries were intentionally not included in the study. Rather, the aim was to gather information on the users and uses of environmental accounts in developed countries to provide developing countries participating in the WAVES partnership with context to use in assessing the policy users/uses of their own environmental accounts.

As noted, many users and uses were identified during the review. Not all of them could be considered "policy-related" however. In order for a user/use to be included under that heading, there needed to be clear evidence that it was oriented either toward analysis of the *need* for policy action or toward the *evaluation* of existing policy. It was usually quite clear whether this was the case. Only users/uses that met one of these criteria are described in the main body of the report. Those that did not are included, however, in the tables that summarize users/uses for each country in the annexes.[3]

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[1] Readers will notice that the depth of coverage of Canada is greater than for other countries in the report. There are two reasons for this. The most important is that the author is a former director of the environmental accounting unit of Statistics Canada and, therefore, is particularly familiar with Canadian users and uses of environmental accounts. The second is that Canada is one of the countries with the greatest breadth in its environmental accounts and the greatest number of years of experience in the field. There is, therefore, quite a rich set of users/uses in Canada to draw from.

[2] Mexico was included in the study because of its particularly long history of work in the field. Botswana, Colombia, and the Philippines also have long histories of work in the field, but they are all members of the WAVES partnership and, therefore, were not considered for review in the study.

[3] For each country, a set of annex tables is provided listing all users/uses, both those with strong policy links and those without. For many of these users, web links are provided so the reader can delve more deeply into the use. It was not possible to provide web links for all users/uses because, in some cases, a user may be known to exist but the details of its use are unknown.

A point that should be noted about the European countries listed below is that they are all subject to a common set of reporting requirements mandated by the statistical office of the European Union (EU), Eurostat. Since 2011, EU member countries have been required by a Eurostat directive to compile environmental accounts related to air emissions, economy-wide material flows, and environmental taxes. This explains the ubiquity of these accounts among the European countries. Regulations are currently being considered to expand the coverage of this directive to include energy accounts, environmental protection expenditure accounts, and accounts for the environmental goods and services sector.

## Countries Reviewed[4]

1. Australia
2. Canada
3. Denmark
4. Finland
5. France
6. Germany
7. Italy
8. Mexico
9. Netherlands
10. Norway
11. Sweden
12. United Kingdom

## Data Collection Method

The primary source of information on users/uses for this study was a survey conducted with the national statistical office in each of the countries. This survey used a simple Excel spreadsheet[5] to gather knowledge regarding users/uses from the officials responsible for the environmental accounts in each office. This approach was taken on the grounds that the producers of environmental accounts are likely to be better aware of how their accounts are used, and by whom, than anyone else.

Of course, it is possible that users/uses exist that are unknown to the producers of environmental accounts. Thus, to supplement the information gained from the statistical offices, Internet research was undertaken to identify additional users/uses.

As a result of these two efforts, a useful range of users/uses was identified for most of the countries studied. The exceptions were Finland and France, for which no information on users/uses could be provided by the statistical office and none was found *via* the Internet.

For the purposes of the study, "environmental accounts" were defined to include (1) all accounts formally considered part of a national environmental accounting system plus (2)

[4] In addition to the countries listed, information was sought from New Zealand but not received.
[5] Attached in Annex 13.

all environmental statistics having the characteristics of environmental accounts but not falling formally under that heading. The characteristics defining "accounts" were given as:

- A formal structure;
- Regular compilation; and
- Consistency over time.

A forest resource inventory was given as an example of a data set that might be considered to share the characteristics of environmental accounts but that would not likely fall under that heading formally. Survey of businesses or households on environmental topics were generally not considered to be sufficiently like accounts to be included in the study, though exceptions were made.[6]

"Users" were defined as any organization or individual that makes use of environmental accounts data, including those internal to the statistical office. Respondents were asked to identify users by name (for example, Ministry of Finance or Water Management Authority).

"Uses" were defined to include any application to which environmental accounts are put, including uses internal to the statistical office (for example, incorporation of environmental accounts data within the national accounts). Routine reporting of environmental accounts data by an agency (for example, in an annual data release) was considered a legitimate use. Information on both direct uses and indirect uses was requested. Direct uses were defined as those in which the environmental accounts data are directly applied to some end; reporting or modeling, for example. Indirect uses are those in which the accounts data are used after first having been modified into another form—for example, a government report that makes use of indicators that were themselves derived from the accounts.

For each user/use, respondents were asked to outline the following:

- **User category.** The category into which the user of the account/statistics in question falls. The options given were national government ministry or agency, regional government ministry or agency, international organization, nongovernmental organization, academic/research institution, consultant, corporation, other.
- **Type of use.** The use to which the account/statistics in question is put. The options given were statistical analysis, modeling/scenario analysis, reporting, indicator compilation, other, unknown.
- **Purpose of use.** The purpose served by the use of the account/statistics in question. The options given were research, public decision making, private decision making,

[6] For example, Canada conducts several business surveys on waste management, environmental protection expenditures, and environmental goods and services that were considered "accounts" for the purposes of this study on the grounds that these are topics that are formally part of environmental accounting systems in many other countries. Canada's survey of household environmental practices, on the other hand, was deemed out of scope for the study, as it deals with subject matter not traditionally thought of as part of environmental accounting.

informing the general public, informing specialized audiences (for example, parliamentarians or international organizations), other, unknown.
- **Web link.** Where the use of the account can be seen on the Internet.

In addition to information on the users and uses of their accounts, respondents were asked to provide basic information about the accounts produced in their country:

- **Name.** Name of account and web link where it may be accessed.
- **Frequency.** The frequency of update of the account/statistics. The options given were quarterly, annual, biennial, triennial, quadrennial, quinquennial or occasional.
- **Geographic scope.** The geographic coverage of the account/statistics. The options given were national, subnational data with political boundaries, subnational with ecological boundaries, or subnational with both.
- **Sectoral scope.** The sectors of the economy covered by the account/statistics. The options given were all sectors, business sector, government sector, household sector.
- **Start year.** The beginning of the longest time period for which consistent data are available from the account/statistics.
- **End year.** The end of the longest time period for which consistent data are available from the account/statistics.
- **Staff costs.** The annual cost to produce the accounts in either employee time or cost.

## Structure of the Report

The findings of this study are presented in the main body of the report on a country-by-country basis in alphabetical order. For each country, a brief overview of the environmental accounting system in terms of the scope, frequency of update, length of time series, and any other relevant information regarding the accounts making up the system is given.

This is followed by a table listing each of the accounts that make up the system and describing them in terms of the basic information noted above (name, frequency, and so on).

The summary table is then followed by in-depth descriptions of the most policy-relevant users/uses for each country. The purpose of these descriptions is to show who is using the accounts and for what purpose and how the uses are related to policy. For the most part, the discussion around these points is factual and drawn directly from the material collected during the research for the study. In addition, comments are offered in various places regarding the features of the accounts that may make them appealing to their users. These comments are the opinion of the author and are based on his experience developing environmental accounts in Canada and internationally.

## Summary of Findings

The research undertaken to prepare this report demonstrates unequivocally that environmental accounts are policy relevant and are actively used in a variety of ways. They

**respond directly to stated policy goals** in a number of nations. In other cases, data from the accounts are used as part of the **evidence base to monitor policy success.** In still others, they feed into **analytical research that either leads to policy action or assesses the success of that action.**

Some of the more interesting examples of the users/uses uncovered in each of these categories are noted immediately below. Many more examples are provided in the main body of the report. Taken together, these examples paint a compelling portrait of the extent to which environmental accounts are relevant to policy in a wide variety of countries with differing environmental issues and national goals.

### *Direct policy relevance*

One of the clearest examples of a direct link between environmental accounting and policy is found in Mexico (see p. 74), where two legislative centerpieces, the climate change act and the ecological balance and environmental protection act, both refer to the need to calculate ecologically adjusted net domestic product. This environmentally adjusted macroeconomic indicator is a central output of Mexico's environmental accounts.

In Sweden, the Environmental Protection Agency has established a "generational goal" that sets the direction for Sweden's environmental policy (see p. 96). This policy reads:

> *The overall goal of Swedish environmental policy is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders.*

This goal requires, among other things, that environmental policy in Sweden not increase environmental and health problems outside of Sweden. This requires, in turn, measurement of Sweden's environmental impact in other countries. Statistics Sweden carries out this measurement using an environmentally extended input-output built upon data from the environmental accounts (see below for further details).

In several countries, policies have been adopted in which the concept of maintaining national wealth—including natural resource wealth—is explicitly recognized. Australia is one such country, where the national treasury's strategic framework (see p. 19) includes a dimension that is directly related to measures of natural resource wealth:

> *Consideration [should be given to] whether the productive base needed to generate opportunities (the total stock of capital, including human, physical, social and **natural assets** [emphasis added]) is maintained or enhanced for current and future generations.*

Another example is Norway, where the national sustainable development strategy includes an indicator for national wealth that draws upon the Norwegian natural resource stock accounts. As the concept of natural wealth gains hold as a legitimate basis for designing government policy, this kind of use of can be expected to grow.

Australia's carbon pricing plan (see p. 15) offers a different take on the relation between policy and environmental accounts. Though there is no direct link between Australia's Greenhouse Gas Emissions Account and the carbon pricing plan, there is an indirect link. The account actually makes use of data from the National Greenhouse and Energy Reporting system, which is an offshoot of the carbon pricing plan. This example demonstrates that the relationship between policy and environmental accounts is not always from accounts *to* policy; the reverse can happen as well.

### *Reporting on the success of policy*

In several countries, the environmental accounts play an important role in relation to reporting on national sustainable development strategies. This use represents one of the clearest trends in the application of environmental accounts. Such use occurs (as just noted) in Norway (see p. 87), Canada (see p. 32), and the United Kingdom (see p. 110). But it is, arguably, most developed in Germany (see p. 64), where the national sustainable development strategy and the environmental accounts share a unique relationship.

The national statistical office in Germany is responsible for preparing a detailed and neutral report on progress toward the nation's sustainable development goals. It relies on its environmental accounts for a significant portion of this report. The German government, for its part, responds directly to the statistical office's report in its own report, which is prepared from a policy perspective. This bilateral exchange between neutral statistical analysis and subjective political analysis is quite unique.

Another example of reporting on policy success is the recent emergence of indicator systems designed to measure the progress, or well-being, of societies. Excellent examples of such systems are found in Australia (see p. 20) and in the United Kingdom (see p. 107). In the case of Australia, data from the environmental accounts are used in a publication prepared by the Australian Bureau of Statistics called *Measuring Australia's Progress.* According to this report, between 2000 and 2012, the economic value of Australia's natural capital per capita decreased by approximately $A7,000, from $A215,000 to $A208,000. This, the report notes, is not a sustainable trend.

In the United Kingdom, the prime minister has asked the Office for National Statistics to prepare a new set of statistics measuring the development of well-being in the United Kingdom, noting that wider and systematic consideration of well-being has the potential to lead to better decisions by government, markets, and the public, and, as such, to better outcomes. In carrying out its mandate, the Office for National Statistics has noted that its integrated environmental accounting framework brings discipline to the organization of environmental and related data and is, therefore, a key tool for managing natural capital and looking "beyond GDP" in assessing well-being.

The measurement of well-being is not restricted to government agencies. In Canada, for example, two research institutes compile their own indexes of well-being using data from the Canadian environmental accounts. The independent Centre for the Study of Living

Standards (CSLS) publishes an index of sustainable economic well-being (see p. 35) in which per capita consumption, per capita wealth, economic equality, and economic security are combined into a single measure reflecting economic well-being in both the *present* and the *future.* The index rose 25.4 percent from 1981 to 2010, considerably below the 46.3 percent growth in real gross domestic product (GDP) per capita over the same period.

The Canadian Index of Wellbeing (CIW), based at the University of Waterloo, also offers an index as an alternative to GDP. Using data from Statistics Canada's Mineral Resource Account, the CIW has found that its "Metals Reserve Index [a component of the overall index] is universally declining [from 1977 to 2008]. While in the last few years the rate of decline has slowed and for now appears stable, reserves are at or near historic lows for virtually all metals."

A major Canadian newspaper, commenting on trends in the overall CIW index, noted that "[while] Canadian [GDP] dropped 8.3 per cent [from 2008-2010], … [m]uch more sobering, is that the well-being index fell by fully 24 per cent."

As more countries engage in moving "beyond GDP" in their measures of progress, it is likely that increased use will be made of environmental accounts for this purpose. They are, in many ways, ideally suited to the task.

Measuring sustainability and well-being is not the only way in which environmental accounts are used to report on policy success. More focused reporting is also carried out. For example, the Netherlands Central Bureau of Statistics is regularly asked by ministries of the Dutch government to compile reports on the performance of certain segments of the economy. In one such study (see p. 83), the "sustainable energy sector" was reviewed using data from the Environmental Goods and Services Account. The results showed a gradual increase in the importance of the sector from 2008 to 2010, with, for example, employment growth of about 4 percent over the period compared with a decrease in employment in the overall Dutch economy.

In Sweden, modeling is used to assess the degree to which Swedish consumption impacts the environment in other countries (see p. 96). As noted above, the "generational goal" that underpins Swedish environmental policy requires that Swedish economic development not increase environmental and health problems outside Sweden's borders. The statistical office uses an environmentally extended input-output model to assess this. It has found that Swedish consumption-related greenhouse gas emissions are about 25 percent greater than production-related emissions, meaning that Sweden is a net exporter of greenhouse gas emissions to the rest of the world.

### *Analytical research in support of policy*

An excellent, and relatively early, example of the analytical use of environmental accounts in support of policy was the development of climate change policy in Canada in the late 1990s and early 2000s. The Canadian Ministry of Finance used data from Statistics Canada's Energy Use and Greenhouse Gas Emissions Accounts extensively in an exercise to

model various policy scenarios for addressing climate change (see p. 28). The ease of integrating data from the environmental accounts into economic modeling frameworks facilitated the ministry's efforts in this regard.

Similarly, a Danish government model called EMMA (see p. 53) was used in the modeling of a strategy for reaching the Kyoto Protocol goal by reducing Danish $CO_2$ emissions by 21 percent in 2012 compared to 1990. The specific strategy modeled included a combination of buying international $CO_2$ quotas, energy savings, increased use of renewable energy sources, and the introduction of a carbon tax.

These two examples, plus the Swedish one noted previously, are illustrative of what is, arguably, the most common use of the environmental accounts: integrated economy-environment modeling.[7] In addition to the government examples just cited, quite a lot of this kind of modeling is done in universities and research institutes. A number of such studies have taken place in Italy, for example (see p. 70), where a group of academic researchers has made extensive use of data from the Italian Air Emissions Account and Environmental Protection Expenditure Account over several studies.

In Germany, the research institute GWS (see p. 66) maintains a model called Panta Rhei that is used for studies of renewable energy, energy efficiency, and a variety of other environment-economy issues.

In Canada, Professor Peter Victor of York University, to name just one of a number of academics using the environmental accounts to conduct research, has done extensive modeling in his studies of low-growth scenarios for the Canadian economy (see p. 30).

[7] It is worth noting that this kind of use is likely to become more important with increasing awareness of planetary boundaries and resource scarcities.

## Australia

Australia's environmental accounts are produced primarily by the Australian Bureau of Statistics, the national statistical agency, with two exceptions. The Greenhouse Gas Emissions Account is prepared by the Australian Department of Environment (formerly by the separate Department of Climate Change and Energy Efficiency). The Water Asset Account is prepared for 12 regions of Australia by the Bureau of Meteorology.

As can be seen, most of Australia's accounts have long time series. The exceptions are the several experimental accounts that are under development, reflecting Australia's active contribution to field of environmental accounting.

Most of the accounts are produced annually, though some are produced less frequently. In the case of the Solid Waste and Land Use/Cover Accounts and the Ecosystem Account of the State of Victoria (accounts 9, 10, and 13), the work is still considered experimental.

Until recently, the accounts have been published separately, but a new annual publication called the *Australian Environmental-Economic Accounts* will combine selected information from the separate accounts, including the Greenhouse Gas Emissions Account prepared by the Australian Department of Environment, into one place. This publication will be released in April 2014.

Most of the accounts, with the exception of the Water Use and Experimental Land Cover/Use Accounts, are produced at the national level only. As for sectoral scope, all accounts cover all sectors of the economy.

Australia is unique among the countries surveyed for this report in that environmental accounts are also produced by a state-level government (Victoria).

The main users and uses of Australia's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 1.

## Summary of Environmental Accounts Compiled, *Australia*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs ($A) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Greenhouse Gas Emissions Account | Annual | National | All sectors | 1990 | 2012 | Not available, but very large (that is, greater than 1 million) | Prepared by the department of climate changes as part of IPCC and Kyoto reporting | Click here |
| **Account 2** | Water Use Account | Annual | National and subnational (political boundaries) | All sectors | 1994 | 2012 | 350,000 | Currently annual, but produced only occasionally until 2008–09 reference year | Click here |
| **Account 3** | Energy Use Account | Annual | National | All sectors | 1996 | 2012 | 200,000 | Currently annual, but produced only occasionally until 2008–09 reference year | Click here |
| **Account 4** | Environmental Protection Expenditures Account | Occasional | National | All sectors | 1991 | 2001 | Each account has typically required 1.5–3 staff years to produce | Prepared historically for all of economy and for parts of the economy, including mining, manufacturing and local government. This account is not currently produced. | No longer produced |
| **Account 5** | Energy Resource Account | Annual | National | All sectors | 1995 | 2012 | 50,000 | Compiled as part of the national balance sheet | Click here<br>Click here |
| **Account 6** | Mineral Resource Account | Annual | National | All sectors | 1995 | 2012 | 50,000 | Compiled as part of the national balance sheet | Click here<br>Click here |
| **Account 7** | Timber Resource Account | Annual | National | All sectors | 1995 | 2012 | 50,000 | Compiled as part of the national balance sheet | Click here<br>Click here |
| **Account 8** | Land Resource Account | Annual | National | All sectors | 1995 | 2012 | 50,000 | Compiled as part of the national balance sheet | Click here<br>Click here |
| **Account 9** | Water Asset Account | Annual | Subnational (ecological boundaries) | All sectors | 2010 | 2012 | n/a | Compiled by the Australian Bureau of Meteorology. Covers 12 water regions within the country but not the country as a whole. Includes data on water | Click here |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | consumption and water stocks for both surface and groundwater. | |
| **Account 10** | Experimental Land Cover/Use Account | Triennial | Subnational (political boundaries) | All sectors | 2011 | 2013 | 250,000 | Experimental accounting program. Land cover/use accounts will be prepared for each Australian state every three years and total coverage of Australia achieved over this cycle. Annual land cover accounts for Australia are planned from 2014. | Click here |
| **Account 11** | Experimental Solid Waste Account | Annual | National | All sectors | 2013 | 2013 | 250,000 | Annual preparation planned | Click here |
| **Account 12** | State of Victoria Water Resource Account | Annual | State of Victoria (ecological regions) | All sectors | 2006 | 2012 | n/a | The State of Victoria compiles its own Water Resource Account covering both water use and stocks. Prior to 2006, the state prepared a "State Water Report." | Click here |
| **Account 13** | State of Victoria Ecosystem Account | Occasional | State of Victoria (ecological regions) | All sectors | 2013 | 2013 | n/a | The State of Victoria compiles its own experimental Ecosystem Account. | Click here |

Note: n/a =

# Highlights of Users and Uses – Australia

### *Australia, Account 1 – Greenhouse Gas Emissions Account*

The national Greenhouse Gas Emissions Account is used as the basis for reporting on Australia's progress toward meeting its climate change commitments to the United Nations Framework Convention on Climate Change (UNFCCC). Australia's national greenhouse gas (GHG) emissions inventory system is unique in that it includes both the "standard" report that all large emitting countries must produce, in which emissions are classified according to the UNFCCC reporting guidelines, and a complementary report, in which emissions are classified according to the Australian standard industrial classification produced by the Australian Bureau of Statistics. The system also includes quarterly updates on GHG emissions trends. Quarterly environmental accounting estimates are compiled in only two other countries.[8]

A carbon pricing plan was enacted by the Australian government in 2012 as part of a broad energy reform package called the *Clean Energy Plan*, which aims to reduce greenhouse gas emissions in Australia by 5 percent below 2000 levels by 2020 and 80 percent below 2000 levels by 2050. The plan set out to achieve to these targets by encouraging Australia's largest emitters to increase energy efficiency and invest in sustainable energy. The scheme is administered by the Clean Energy Regulator.[9]

Though there is no direct link between the Greenhouse Gas Emissions Account and the carbon pricing plan, there is an indirect link in that the account makes use of data from the National Greenhouse and Energy Reporting system. Thus, this is an example in which policy has led to the development of a new data reporting system that has, in turn, improved the quality of an environmental account.

[8] The other countries are the Netherlands, which also estimates greenhouse gas emissions on a quarterly basis, and Canada, which plans to begin estimating national wealth on a quarterly basis beginning in the fall of 2014.

[9] Note that following the change of government in Australia as of September 2013, legislation has been implemented to repeal the carbon pricing plan. This legislation was before the Australian Parliament at the time of writing of this report and it is unclear whether it will be passed into law or not.

### *Australia, Account 2 – Water Use Account*

The Australian Productivity Commission undertook a suite of research related to water reform, including the effects of expanding water trade and the management of environmental externalities associated with the supply and use of irrigation water. This research was based on the irrigation industry in the southern Murray-Darling Basin, where the majority of irrigation in Australia occurs.

A foundation for this research was a detailed understanding of irrigated agriculture in the southern Murray-Darling Basin, including the existing patterns of water use; the emerging trade in water property rights, and the likely behavioral responses of individual irrigators to changing water prices. The Water Use Account produced by the Australian Bureau of Statistics was used to provide background information on existing patterns of water use.

One paper in this suite explores the determinants of the elasticity of demand for irrigation water. It focuses on three main irrigated industries—rice, dairy, and horticulture—to gain a greater understanding of the value that farmers place on water as an input. The paper provides detail relating to farm decision behavior and biophysical production realities faced by irrigators in the southern Murray-Darling Basin. Its findings include the following:

- In the long run, prices received in competitive industries are expected to cover long-run average costs, including a "normal" profit to owners of the business. Consequently, any significant decrease in long-run costs will eventually be passed on to the consumer.

- In the long run, some irrigators will respond to increased water prices by changing outputs. Physical constraints to changing outputs include the topography of the farm, soil types, water availability, and climate. Other constraints may include capital availability, type of tenure for land, the supply reliability of irrigation water, access to markets and regional infrastructure, and taxation.

- If a large number of irrigators move from one activity to another, the change may affect commodity prices received in both the activity they leave (prices may go higher) and the one they enter (prices may go lower).

- While the determinants of the price of rural land are complex, the potential profitability of the activities that can be carried out on that land is an important factor. Any change that reduces the long-run profitability of irrigated activities will tend to reduce the price of that land.

The *Balancing Act* report produced by the Australian Commonwealth Scientific and Industrial Research Organization and the University of Sydney used the well-developed analytical approach of generalized input-output analysis to develop a quantitative "triple bottom line" account of the Australian economy for ten indicators: three financial, three social, and four environmental. For each of 135 economic sectors, every indicator is

calculated as an intensity; that is, per one dollar of final demand or per one dollar spent for consumption in everyday life. The indicators are generated with a supply chain approach where all activities are included, or "embodied," in the final indicator number. Taken together, these ten indicators provide a macro-landscape against which many management issues can be benchmarked.

Four environmental indicators are used: greenhouse gas emissions, primary energy use, managed water use, and land disturbance. Data from the Water Use Account were used for the purposes of the water use indicator. The fact that the Water Use Account is compiled using the industrial classification of the *System of National Accounts*, which is also used in the Australian Input-output Tables, makes their use in such a study relatively straightforward.

From an environmental perspective, the researchers interpreted that a sector performing "above average" in triple bottom line terms would have lower than average intensity values for each of the four indicators. The indicators were all referenced against one dollar of final demand. Average values of these indicators for the economy as a whole were 1 kilogram of $CO_2$ equivalent greenhouse gas emissions per dollar; 7.7 megajoules of primary energy use per dollar; 41 liters of managed water use per dollar; and 3.2 square meters of land disturbance per dollar. One of the insights that emerged from the analysis of these indicators for all 135 industries in the economy is that the prices consumers pay for primary production items do not reflect the full value of the natural resources embodied in their production chains.

### *Australia, Account 3 – Energy Use Account*

The Australian Clean Energy Council has prepared a report using data from the Energy Use Account designed to provide a snapshot of Australia's renewable energy and energy efficiency sector at the end of the 2012 calendar year. Some of its highlights include the following:

- According to the Australian Bureau of Statistics' Energy Use Account and Survey of Environment Values and Behaviour, almost 90 percent of people took some kind of action in 2012 to reduce their power bills.[10] Steadily rising power prices mean that Australian homes and businesses have invested in energy-smart appliances and technology such as solar power and solar hot water to reduce their electricity bills. The result is that overall demand for electricity has fallen for the last four years.

- Renewable energy such as solar, wind, hydro, and bioenergy provided 13 percent of Australia's electricity in 2012. There are now more than a million Australian homes that have installed a solar power system, along with more than 800,000 that have a solar hot water system. Hydro electricity still produces the lion's share of Australia's renewable energy, but wind power is making solid progress. Wind power provided

[10] http://www.abs.gov.au/ausstats/abs@.nsf/mf/4626.0.55.001

enough electricity for the equivalent of more than a million homes for the first time in 2012.

- On January 1, 2013, there were 15 major renewable energy projects under construction, representing a total of 1679 megawatts of generating capacity. There were 14 large-scale renewable energy projects that came online in 2012, totaling 380 megawatts.

### *Australia, Accounts 5, 6, 7 and 8 – Natural Resource Stock Accounts*

The Australian natural resource stock accounts include the accounts data for energy, mineral, timber, and land resources and are included formally as part of the National Balance Sheet Account of the Australian Bureau of Statistics. According to the Australian Bureau of Statistics report *Completing the Picture*,[11] the value of these four types of natural capital is approximately equal to that of the produced capital for the nation. The value of natural capital and produced capital in Australia both showed an upward trend in the period from 2000–01 to 2009–10. During this period natural capital more than doubled in value from $A1,528 billion to $A4,574 billion (see figure 1). The estimates of natural capital are noted to be incomplete; no values have been included for water, habitat and ecosystems and soil resources. Inclusion of these natural assets would substantially increase the overall value of natural capital.

**Figure 1. Australia's Capital Base, Current Prices ($A)**

| Capital Estimate | 2000-01 $b | 2005-06 $b | 2006-07 $b | 2007-08 $b | 2008-09 $b | 2009-10 $b |
|---|---|---|---|---|---|---|
| Produced Capital(a) | 2 251.2 | 3 271.5 | 3 554.0 | 3 843.4 | 4 048.0 | 4 227.9 |
| Net Financial Assets with the rest of the world | -362.5 | -528.7 | -613.2 | -658.5 | -703.7 | -776.9 |
| Natural Capital(partial) | 1 528.1 | 3 117.4 | 3 512.3 | 3 773.4 | 3 936.1 | 4 574.3 |
| Human Capital | 6 769.8 | na | na | na | na | na |
| Social Capital | na | na | na | na | na | na |

na not available
(a) Excludes plantation timber inventories, which are included under Natural Capital
Source: Australian System of National Accounts, 2010-11 (ABS cat. no. 5204.0)

*Completing the Picture* notes that the Australian federal and subnational governments have implemented a number of policies and programs aimed at addressing sustainability (see figure 2). These have similar objectives and in general aim to maximize the benefits of natural resource use over time. One of the common features of the policies is the express need for consistent information on economic, environmental, and social aspects of Australia.

[11] Australian Bureau of Statistics, *Completing the Picture: Environmental Accounting In Practice,* Catalogue No. 4628.0.55.001, 2012, http://www.abs.gov.au/ausstats/abs@.nsf/mf/4628.0.55.001.

**Figure 2. Sustainability Policies in Australia**

| Government | Sustainability policy |
|---|---|
| Australian | Sustainable Australia - Sustainable Communities Ecological Sustainable Development for Government Agencies |
| | The Australian Treasury's Strategic Framework |
| | Clean Energy Future |
| New South Wales | Sustaining Our Environment |
| Victoria | Our Environment Our Future |
| Queensland | Toward Q2: Tomorrow's Queensland (web page under review) |
| South Australia | South Australia's Strategic Plan 2007: Goal 3 - Attaining Sustainability |
| Western Australia | Hope for the Future: The Western Australian State Sustainability Strategy |
| Tasmania | Tasmania Together |
| Northern Territory | Territory 2030 Plan |
| Australian Capital Territory | People Place Prosperity: A Policy for Sustainability in the ACT |

The Australian Treasury's strategic framework, in particular, sets out five policy dimensions that directly or indirectly have important implications for Australians' well-being and that are particularly relevant to the work of the Treasury (the Australian finance ministry). The third dimension is directly related to measures of natural resource stock values:

1. **The set of opportunities available to people.** This includes not only the level of goods and services that can be consumed, but also good health and environmental amenity, leisure, and intangibles such as personal and social activities, community participation, and political rights and freedoms.
2. **The distribution of those opportunities across the Australian people.** In particular, that all Australians have the opportunity to lead a fulfilling life and participate meaningfully in society.
3. **The sustainability of those opportunities available over time.** In particular, consideration of whether the productive base needed to generate opportunities (the total stock of capital, including human, physical, social, and natural assets) is maintained or enhanced for current and future generations.
4. **The overall level and allocation of risk borne by individuals and the community.** This includes a concern for the ability, and inability, of individuals to manage the level and nature of the risks they face.
5. **The complexity of the choices facing individuals and the community.** The concerns include the costs of dealing with unwanted complexity, the transparency of government, and the ability of individuals and the community to make choices and trade–offs that better match their preferences.

The inclusion of the value natural resource assets in the Treasury's strategic policy demonstrates the extent to which the notion that the value of assets is linked to the long-term opportunities for well-being has become mainstream, at least in some countries. Since the main purpose of the natural resource stock accounts is to measure the natural resource portion of this value, they are clearly of direct relevance to the Treasury's strategic policy.

In a report titled *Measures of Australia's Progress (MAP),* the Australian Bureau of Statistics (ABS) presents a suite of indicators intended to help answer the question, "Is life in Australia getting better?" The report provides a summary of progress measures informing on areas of life that Australians feel are important for national progress.

The *MAP* report is at the vanguard of international progress measurement activity. To enable quick assessment of whether life in Australia is improving, a dashboard display is provided (see figure 3). The dashboard shows, using visually simple icons, whether progress, regress, or little change has been made in each of the thematic areas.

With respect to the environment theme, Australians believe that acting to sustain the natural environment and its resources for the long term is important to business, government, communities, and society. People feel that how the environment's resources are used affects their present well-being and the well-being of future generations. Australians support the development of adaptive technologies and strategies to enable environmental sustainability. Many believe it is important to be aware of the impact of human activities or lifestyles on the environment, particularly those that either moderate resource depletion or threaten long-term sustainability.

According to the 2013 *MAP* report, the quality of life in Australia with respect to the environment overall has regressed over the last decade. This conclusion is based on the finding that Australia's net greenhouse gas emissions (the headline progress indicator for managing the environment sustainably) have increased over the period. Net greenhouse gas emissions is considered a good measure of progress for managing the environment sustainably because a reduction in greenhouse gas emissions is likely to reflect increased efforts to combat the human impact that Australia is contributing toward climate change. Without reduced greenhouse gases, on an international scale, the negative environmental impacts of a changing climate will not only continue but increase.

Another environmental indicator used in the *MAP* report is the sustainability of the use of natural resources, which is measured using a chain volume measure[12] of the value of natural resource stocks *per capita*.

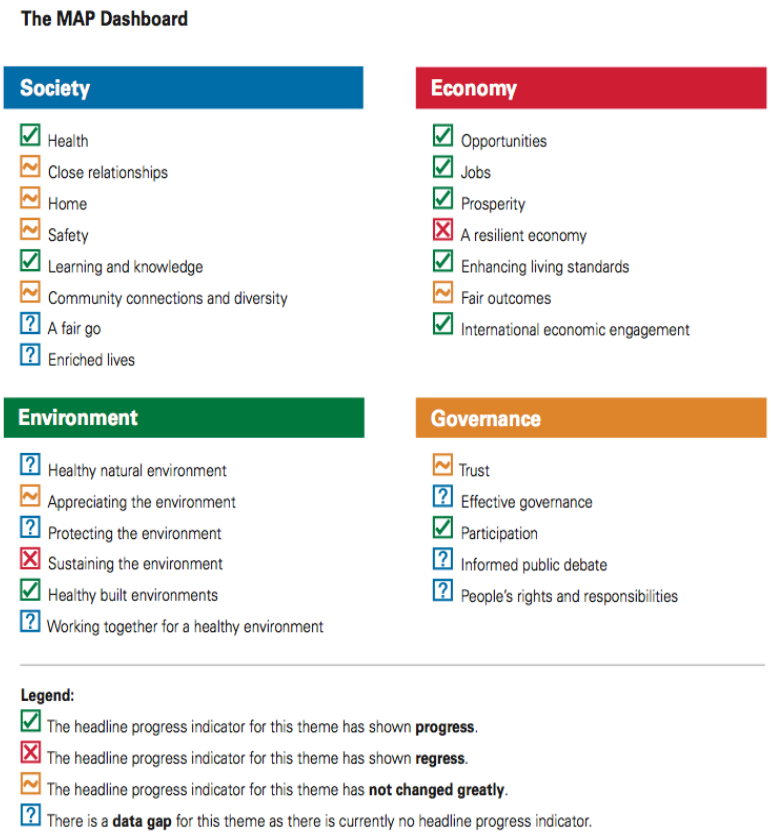
According to the report, there has been regress over the last decade in the sustainable use of natural resources in Australia because the per capita value of natural resources has decreased.

Between 2000–01 and 2011–12, the economic value of Australia's natural capital per capita decreased by approximately $A7,000, from $A215,000 to $A208,000. This occurred even though over the same period, Australia's natural resource base actually *increased* in economic value from $A4,144 billion to $A4,718 billion. Despite this increase, an even greater increase in population over the same period meant that each Australian's share decreased. To see progress in the sustainable use of natural resources, the growth in the

[12] A chain volume measure considers the evolution of the physical quantities of natural resources over time using the relative value of each resource as its weight in the index.

economic value of Australia's natural capital would need to at least keep pace with population growth.

**Figure 3. The Australian MAP Dashboard**




### *Australia, Account 10 – Experimental Land Cover/Use Account*[13]

The Australian Bureau of Statistics' Land Cover/Use Account is considered experimental at the moment and there are, therefore, no regular users. One potential user of a regularly produced Land Cover/Use Account would be the manager of the park, the Great Barrier Reef Marine Park Agency (GBRMPA).

The management goals for the Great Barrier Reef Marine Park (GBRMP) are to provide for the long-term protection and conservation of the environment, biodiversity, and heritage values of the Great Barrier Reef region; to allow ecologically sustainable use of the Great Barrier Reef region for various purposes; to encourage engagement in the protection and management of the Great Barrier Reef region; and to assist in meeting Australia's international responsibilities in relation to the environment and protection of world heritage.

[13] The material in this section is drawn from Australian Bureau of Statistics, *Completing the Picture: Environmental Accounting in Practice,* Catalogue No. 4628.0.55.001, 2012, http://www.abs.gov.au/ausstats/abs@.nsf/mf/4628.0.55.001.

More specifically, the GBRMPA Corporate Plan provides three objectives for management guidance:

- Address key risks affecting the outlook for the Great Barrier Reef.
- Ensure that management delivers ecologically sustainable use of the Great Barrier Reef.
- Maintain a high-performing, effective, and efficient organization.

Land is an important asset and represents a large proportion of the value (36 percent) of Australia's economic assets. Practically all economic activities involve the use of land. As of June 30, 2011, Australia's land was valued at $A3,785 billion. The land in the Great Barrier Reef region was valued at $A71.9 billion. The value of land depends on many factors, including location (for example, proximity to major population centers, transport corridors, water sources, and the beach), land cover, and land use.

The use and management of the land in the Great Barrier Reef region catchment has a significant impact on the condition of the Great Barrier Reef. For example, the use of land for agriculture will usually result in higher levels of sediment, nitrogen, and phosphorous being carried by rivers to the Great Barrier Reef than if the land had been used for other purposes.

Land cover/use accounts, linked to economic activity (in this case agriculture), can be used to monitor areas and activities that may impact on the reef as well as the economic cost and impact of constraining these activities.

Since the human settlement of Australia, significant changes to land cover have occurred, but land cover has not changed significantly in the last ten years. However, in coastal areas where the majority (85 percent) of people in Australia live, the impact of land cover or land use changes may have significant impacts at a local and regional level.

The experimental Land Cover Account prepared by the ABS to assess changes in land cover occurring in the Great Barrier Reef shows that forest extent dropped by 13 percent to 14.6 million hectares during the 10-year period ending 2008. Pre-1750, 18.0 million hectares of eucalypt woodlands existed in the Great Barrier Reef region, while in 2006 eucalypt woodlands covered 10.6 million hectares. Most of the forest has been converted to cleared, non–native vegetation and buildings, which covered 14.3 million hectares, or 37 percent of the Great Barrier Reef region in 2008.

Land use is the activity that occurs on land—for example, agriculture, forestry, mining and or dwelling. This differs from land cover, which describes the physical surface of the earth, rather than the activity on the land. Often there is a relationship between land cover and land use, such as the case with agricultural crops, but this is not always so; for example, a forest can have multiple uses, such as being used to produce timber, used for conservation, or a combination of both. National parks and other reserve types are not representative of

all land cover types, hence the cross classification of land use and land cover. As can be seen in figure 4, industries occupy the greatest area of land in the Great Barrier Reef region (note that "NRM" in the figure refers to "natural resource management" areas).

**Figure 4. Land Use by Sector in the Great Barrier Reef Region**

| NRM region | Industry ha | Government ha | Unallocated(a) ha | Green Space ha | Water Bodies ha | Rail and Roads ha | Other Land Use(b) ha | Total ha |
|---|---|---|---|---|---|---|---|---|
| Wet Tropics | 780 119 | 84 274 | 322 903 | 910 565 | 16 652 | 20 200 | 32 130 | 2 166 844 |
| Burdekin | 10 702 348 | 213 490 | 2 247 603 | 451 855 | 100 858 | 25 700 | 339 631 | 14 081 486 |
| Mackay Whitsunday | 443 755 | 16 722 | 215 420 | 136 187 | 7 279 | 15 000 | 71 861 | 906 224 |
| Fitzroy | 10 688 026 | 424 906 | 2 397 531 | 1 741 070 | 90 679 | 50 300 | 220 915 | 15 613 426 |
| Burnett Mary | 2 704 727 | 91 978 | 1 253 996 | 1 165 857 | 41 545 | 40 400 | 21 314 | 5 319 818 |
| **Total Great Barrier Reef region** | **25 318 976** | **831 371** | **6 437 453** | **4 405 534** | **257 013** | **151 600** | **685 853** | **38 087 799** |

(a) Comprises land owned by households and cadastral parcels that could not be otherwise allocated.
(b) Land that could not be classified.

Water is a valuable resource for use in agriculture, other industries, and by households. The agriculture, forestry and fishing industries in Australia, for example, generated $A28,764 million in gross value added while consuming 7,187 gigaliters of water in 2009–10. The gross value of agricultural production in the Great Barrier Reef region in 2009–10 was $A4,480.61 million, and $A1,999.76 million of this was irrigated agricultural production using 1,185.2 gigaliters of water. The Burdekin NRM had the highest agricultural water use in the Great Barrier Reef region, and the Wet Tropics NRM had the highest household water use in the Great Barrier Reef region. This possibly reflects the differences of attributes between NRMs such as the size of the NRMs (the Burdekin is one of the largest NRMs in the Great Barrier Reef region), the predominant land use in each NRM, the difference in population between the NRMs, and the difference in annual rainfall.

Human activities in the river catchments that drain into the Great Barrier Reef lagoon have a significant impact on the water quality of the region. For example, increases in urbanization, infrastructure, and industrial activities such as agriculture, mining, and tourism, are all factors that impact on the water quality that flow to the Great Barrier Reef.

Environmental accounts can link changes in the land use and land cover of the Great Barrier Reef catchments to the water quality of the Great Barrier Reef, and provide a tool to assist in the management of the Great Barrier Reef catchments. For example, in the Great Barrier Reef land account, it can be seen that agriculture is by far the largest industry (in terms of area) being undertaken in the Great Barrier Reef catchments.

### *Australia, Account 11 – Experimental Solid Waste Account*[14]

The Australian Department of the Environment released a National Waste Policy in November 2009. The aims of the National Waste Policy are to do the following:

- Avoid the generation of waste, reduce the amount of waste (including hazardous waste) for disposal.
- Manage waste as a resource.
- Ensure that waste treatment, disposal, recovery, and reuse is undertaken in a safe, scientific and environmentally sound manner.
- Contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency, and the productivity of the land.

The policy sets directions in six key areas:

1. **Taking responsibility.** Shared responsibility for reducing the environmental, health and safety footprint of products and materials across the manufacture-supply-consumption chain and at end-of-life.
2. **Improving the market.** Efficient and effective Australian markets operate for waste and recovered resources, with local technology and innovation being sought after internationally.
3. **Pursuing sustainability.** Less waste and improved use of waste to achieve broader environmental, social, and economic benefits.
4. **Reducing hazard and risk.** Reduction of potentially hazardous content of wastes with consistent, safe, and accountable waste recovery, handling, and disposal.
5. **Tailoring solutions.** Increased capacity in regional, remote, and indigenous communities to manage waste and recover and reuse resources.
6. **Providing the evidence.** Access by decision makers to meaningful, accurate, and current national waste and resource recovery data and information to measure progress and educate and inform the behavior and the choices of the community.

The Experimental Solid Waste Account produced by the Australian Bureau of Statistics could contribute to the last of the six key directions. In particular, the waste account provides consistent economic and physical data on the following:

- The waste "market" and, in particular, which sectors (that is, private or government) and industries are providing these services.
- What services are being provided and the value of these services.
- Which industries have the greatest demand for waste services.
- Whether waste recovery is becoming more profitable.

[14] This use of the Solid Waste Account is hypothetical, since the account is still considered "experimental" and has only been released by the Australian Bureau of Statistics once (November 2013).

# Canada

Canada's environmental accounts are produced by Statistics Canada, the national statistical agency.

Approximately 12.5 full-time-equivalent staff members are employed in compiling and reporting the environmental accounts. These staff members are involved in both regular production activities and research.

Most of Canada's accounts are produced either annually or biennially, though some are produced only occasionally. In the case of the Ecosystem Account (account 12), the work is still considered experimental.

The geographic and sectoral scope of the accounts varies considerably. In the cases of the Solid Waste, Environmental Protection Expenditure, and Environmental Goods and Services Accounts (accounts 9, 10, and 11), the sectoral scope is restricted to the business sector only. This is because these are not "accounts" in the strict sense of the term but, rather, regular surveys conducted by Statistics Canada. They are included here because they share many of the characteristics of accounts other than sectoral comprehensiveness.

The main users and uses of Canada's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 2.

## Summary of Environmental Accounts Produced, *Canada*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Greenhouse Gas Emissions Account | Annual | National | All sectors | 1990 | 2010 | 1 | Covers carbon dioxide, methane, and nitrous oxide emissions. Measured in physical terms only. | Click here |
| **Account 2** | Water Use Account | Biennial | National | All sectors | 2005 | 2009 | 0.5 | Measured in physical terms only | Click here |
| **Account 3** | Energy Use Account | Annual | National | All sectors | 1990 | 2010 | 1 | Measured in energy units only | Click here |
| **Account 4** | Mineral Resource Account | Annual | National and subnational (political boundaries) | All sectors | 1961 | 2012 | 1.5 | Covers iron, copper, nickel, lead, zinc, molybdenum, silver, gold, uranium, potash, sulfur, and miscellaneous minerals (including diamonds). The start year and end year vary slightly depending on the mineral in question. Measured in physical terms and, where possible, monetary terms. | Click here |
| **Account 5** | Energy Resource Account | Annual | National and subnational (political boundaries) | All sectors | 1961 | 2012 | 1 | Covers conventional crude oil, crude bitumen (oil sands), conventional natural gas, and coal. The start year and end year vary slightly depending on the energy type in question. Measured in physical terms and, where possible, monetary terms. | Click here |
| **Account 6** | Water Resource Account | Occasional | National and subnational (ecological boundaries) | All sectors | 1971 | 2009 | 2 | This account has only been prepared once. Staff costs reflect the resources required for initial account development (maintenance requirements would be lower). The account does not follow SEEA guidelines for water stock accounts. Rather, it focuses on measuring water yield. | Click here |
| **Account 7** | Timber Resource Account | Annual | National and subnational | All sectors | 1961 | 2012 | 0.25 | Covers timber accessible for harvest and not accessible for harvest. Timber | Click here |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | (political boundaries) | | | | | stocks are divided into coniferous, deciduous and mixed. Measured in physical terms and monetary terms. Physical measures are not as up-to-date as monetary measures. | |
| **Account 8** | Land Use/Cover Account | Quinquennial | National and subnational (political and ecological boundaries) | All sectors | 1971 | 2011 | 1 | The Land Use/Cover Account is updated once every five years following the Census of Population cycle. It uses provincial, ecozone, and watershed boundaries to define spatial units. The full account is measured only in physical terms. The value of agricultural land and built-up land is separately measured annually as part of the *System of National Accounts*. The land account is not published as such, but is used rather as a spatial analytical framework applied in a variety of other statistical products. The ecoregion profile shown in the link provided here is one example. | Click here |
| **Account 9** | Solid Waste Account | Biennial | National and subnational (political boundaries) | All sectors | 1996 | 2010 | 0.75 | This is not a formal account but rather the output of a biennial survey of the public and private waste management industry. | Click here |
| **Account 10** | Environmental Protection Expenditure Account | Biennial | National and subnational (political boundaries) | Business sector | 1995 | 2010 | 0.75 | This is not a formal account but rather the output of a biennial survey of environmental protection expenditures by business. | Click here |
| **Account 11** | Environmental Goods and Services Account | Biennial | National and subnational (political boundaries) | Business sector | 2008 | 2010 | 0.75 | This is not a formal account but rather the output of a biennial survey of environmental goods and services production in the business sector. | Click here |
| **Account 12** | Ecosystem Account | Occasional | National and subnational (political and ecological boundaries) | All sectors | | | 2 | This is an experimental account that has been produced only once. Staff costs reflect the resources required for initial account development (maintenance requirements would be lower). Consideration is being given to preparing some aspects of ecosystem accounts on a regular basis. | Click here |

Note: FTE = Full-time equivalent

## Highlights of Users and Uses – *Canada*

### *Canada, Account 1 – Greenhouse Gas Emissions Account*

In the mid-1990s, the Canadian Ministry of Finance began working on the integration of energy use and greenhouse gas emissions into one of its existing macroeconomic models. The intent was to use the model, along with models operated by other government departments and outside organizations, in the process of developing policy options for addressing climate change. The focus of much of the work of the Ministry of Finance was on tax policy options. The data required to augment the existing model to handle energy/greenhouse gas scenarios came from Statistics Canada's energy use and greenhouse gas emissions accounts. The fact that these accounts were structured according to the industrial structure of the *System of National Accounts* made it straightforward for the modelers to incorporate the data into the existing model. The use of the model to address climate change policy was a cornerstone of the ministry's sustainable development objectives during this period. The 2001–03 sustainable development strategy, in which this modeling is mentioned, can be found here.[15]

The model was used actively from about 1997 to about 2004, the period during which the most activity was devoted to exploring Canada's climate change policy options. Ultimately, the government decided to pursue a multifaceted approach to climate change policy in which one element was a form of emissions trading among the largest GHG emitters in the economy. The various models used by the government during this period, including the finance ministry's augmented model, were instrumental in coming to this policy choice.[16]

Similar uses of data from the Energy Use and Greenhouse Gas Emissions Accounts have been made by other ministries of the Canadian government. The Ministry of Foreign Affairs and International Trade has used made use of the data in modeling of the environmental implications of Canadian trade. The Ministry of the Environment has similarly made use of the data in its annual emissions forecasting report and for policy analysis purposes. At the subnational level, the Ministry of Finance of the province of Ontario also makes use of the data in a model used for policy analysis.

The data are also used by academic researchers, often for the purpose of modeling. Two such studies are Tombe and Winter[17] and Hayami and Nakamura.[18]

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[15] At the time, each ministry of the Canadian government was required to prepare a sustainable development strategy once every three years. This approach has since been replaced by a unified federal sustainable development strategy that is prepared by the Ministry of the Environment.

[16] A change of government in 2006 led to a change in policy and the tradable emissions permit system for large emitters was never implemented.

[17] T. Tombe and J. Winters, "The Importance of Policy Neutrality for Lowering Greenhouse Gas Emissions," School of Public Policy Research Papers 6, no. 14 (March 2013), University of Calgary.

Tombe and Winter's study looked at optimal policies for controlling greenhouse gas emissions. They note that different policies increase input costs differently across firms and can create costly distortions in the market. Setting energy intensity targets, for example, is a clear example of a policy that disproportionately burdens lower productivity firms, possible leading some to shut down altogether.

Using a detailed model of the Canadian economy with data from Statistics Canada's Energy Use and Greenhouse Gas Emissions Accounts, they explore the consequences of the several forms that greenhouse gas reduction policies can take. They find the best approach to lowering greenhouse gas emissions is one that is neutral across firms—one that affects the cost of energy for smaller firms no more, or less, than larger ones. The only policy that fulfills that criterion is a flat energy tax, or carbon tax. However, they note, a carbon tax could well be politically unsellable in Canada, leaving governments to resort to politically palatable but economically risky intensity targets instead. Recognizing this, they explore a number of ways to improve the performance of intensity targets. First, they argue that governments should allow firms the option to pay a fine if an intensity target is violated. Second, they propose a compensation scheme to firms covered by the regulation to prevent bankruptcy. These modifications, they find, can bring the economic cost of intensity standards closer to flat energy taxes.

In a joint study of Canada and Japan, Hayami and Nakamura make use of input-output models for the two countries augmented with energy use and greenhouse gas data from the environmental accounts to study a variety of issues, one of which is the possibility of lowering overall global greenhouse gas emissions through strategic locating of product manufacturing. Using the case of photovoltaic cells, the authors find that Japan could lower the $CO_2$ emissions from its photovoltaic production if it made use of Canada as the location for manufacturing the silicon required to produce the cells.

In another aspect of the study, they consider the benefits of paper recycling for reducing greenhouse gas emissions and find that these benefits are highly sensitive to the amount of fuel required to collect and transport waste paper to the recycling facility. The $CO_2$ emissions associate with this transportation limit the benefits that can be achieved from recycling. Increasing the share of recycled pulp in paper production beyond about two thirds yields no further benefits in terms of $CO_2$ reductions.

In yet another part of the study, the authors use their input-output model to show what the effects of bilateral trade are on the two countries' $CO_2$ emissions. They find that trade between Japan and Canada had a net positive effect, though small, on their combined $CO_2$ emissions. In other words, if the two countries had not traded, their combined emissions would have been slightly higher than in reality.

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[18] H. Hayami and M. Nakamura, "Greenhouse Gas Emissions in Canada and Japan: Sector-specific Estimates and Managerial and Economic Implications," *Journal of Environmental Management* 85, no. 2 (October 2007): 371–392.

In an interesting use of data from the Greenhouse Gas Emissions Account, Canadian green energy company Bullfrog Power incorporated data from a study of household greenhouse gas emissions conducted by Statistics Canada into marketing materials for a new product—"green" natural gas—that it was bringing to market. Bullfrog Power wanted to show its potential customers that even though natural gas is already considered a relatively "green" fossil fuel, it is still responsible for a significant share of household greenhouse gas emissions. It did this by comparing household emissions from natural gas combustion to other sources of household emissions, noting that natural gas emissions were about 77 percent of emissions from passenger cars.[19]

In a study published in *Ecological* Economics,20 Professor Peter Victor of York University in Toronto, Canada, used data from the Greenhouse Gas Emissions Account to discuss the interplay of economic scale and intensity in determining greenhouse gas emissions. The study presents several macroeconomic scenarios using LowGrow, a simulation model of the Canadian economy (for further details, see the discussion below of Professor Victor's use of Forest Resource Account data). The scenarios considered are "business as usual," which is a projection into the future of past trends; "selective growth," in which differential growth rates are applied to parts of the economy according to their direct and indirect greenhouse gas emissions; and "degrowth," where the average GDP/capita of Canadians is reduced toward a level more consistent with a world economy the size of which respects global environmental limits.

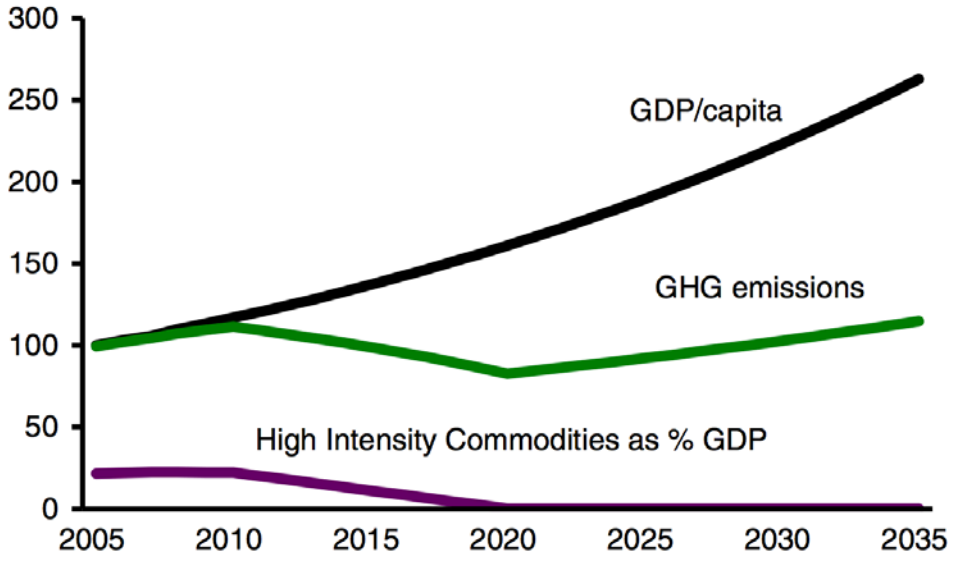
A central question Victor wanted to address in the study was how much benefit an economy could achieve in terms of greenhouse gas emissions reduction by selectively reducing growth in consumption of goods and services with high greenhouse gas intensity (that is, those for which the ratio of emission to dollars of consumption is relatively high). To study this question, Victor combined data from Statistics Canada's Greenhouse Gas Emissions Account with his LowGrow model to study the effect of gradually reducing

[19] It is worth looking at this analysis in a bit more detail. The comparison that Bullfrog Power did was between Statistics Canada's estimate of household GHG emissions from natural gas use and Environment Canada's estimate of "light-duty gasoline vehicle" GHG emissions from Canada's national greenhouse gas emissions inventory. There are two problems with this comparison. First, Bullfrog Power equated "light-duty gasoline vehicles" with "passenger cars," implying that all passenger vehicles are "light-duty gasoline vehicles." This is not, in fact, true. Many passenger vehicles are considered "light-duty gasoline trucks" (the sport-utility vehicles that are popular with households, for example). Second, not all light-duty vehicles (either cars or trucks) are driven by households. Many are driven by businesses and governments (taxis, delivery vehicles, emergency vehicles, and so on). Thus, Bullfrog Power was not comparing "apples to apples" when it divided household natural gas emissions by light-duty passenger vehicles. This is unfortunate, since the same Statistics Canada study from which it took the data on natural gas emissions also provided an estimate of emissions from household use of road vehicles. Had Bullfrog Power used that figure, natural gas emissions would have amounted to about 45 percent of road vehicle emissions—a still impressive figure. The story is illustrative because it shows (1) the dangers of combining data from two different data sets and (2) the advantage of environmental accounts, which provide a consistent and complete accounting of greenhouse gas emissions broken down by economic sector that is ideally suited to the kind of analysis that Bullfrog Power wanted to do.

[20] Peter A. Victor, "Growth, Degrowth and Climate Change: A Scenario Analysis," *Ecological Economics* 84 (2012): 206–212.

consumption of high-intensity goods and services to zero. The results (see figure 5) show that this approach provides only a temporary respite from growth in emissions, at least for the model of the Canadian economy used by Victor. This is because high-intensity goods can only be substituted for by low-intensity goods for so long. Once all the substitution has taken place, emissions begin to grow again as the economy overall continues to expand.

**Figure 5. Victor's Selective Growth Scenario**




In an interesting and thorough critique of the concept of "green jobs," professors Jennifer Winter and Michael Moore of the School of Public Policy at the University of Calgary, Canada, use data from the Environmental Goods and Services Account in a critique of the concept of "green jobs" (see account 11 below for further discussion). They conclude that a better way to track the "greening" of business is by monitoring the evolution of greenhouse gas intensity using data from the Greenhouse Gas Emissions Account. They argue that greenhouse gas emissions and emission intensity allow more uniform comparison and measurement of industries. This allows interested parties to evaluate the greening of industries over time, as well as relative to each other. Reducing greenhouse gas emissions is, in Winter and Moore's view, far better environmental policy than counting and using green jobs as a measure of environmental performance. Economies can certainly benefit from "greening," but a baseline is needed for monitoring and tracking improvements over time. Greenhouse gas emission intensities, as measured in environmental accounts, provide this metric, they argue. On this point, it is worth quoting them verbatim:

> *If minimizing energy use and greenhouse gas emissions is [a] desired policy outcome, then measuring the intensity of energy use and greenhouse gas emissions per unit of output can be the only meaningful metric. It may not have the political appeal that a promise of "green jobs" does. But unlike "green jobs," both of these measures provide quantifiable, non-arbitrary metrics of environmental performance and progress. In other words, unlike the problematic, arguably illusory concept of "green employment,"*

*measuring energy-use intensity and emissions intensity actually tells us very clearly and reliably whether we are making the environment better or worse.*

### *Canada, Account 2 – Water Use Account*

The Canadian Ministry of the Environment uses data from the Water Use Account to compile two indicators in its Canadian Environmental Sustainability Indicators: water availability in Canada and water withdrawal and consumption by sector. These indicators serve as the measurement system for the Canadian Federal Sustainable Development Strategy. This strategy, prepared under the leadership of the Ministry of the Environment, is a central feature of the Canadian government's environment and sustainable development policy. The Canadian Federal Sustainable Development Act defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The act states that "the Government of Canada accepts the basic principle that sustainable development is based on an ecologically efficient use of natural, social and economic resources."

The government's approach to sustainable development therefore reflects a commitment to minimizing the environmental impacts of its policies and operations as well as maximizing the efficient use of natural resources and other goods and services. The approach continues to evolve—notably, toward greater recognition of synergies between environmental and economic sustainability and toward recognition of the value of natural capital in underpinning economic and social prosperity, both for the present and into the future.

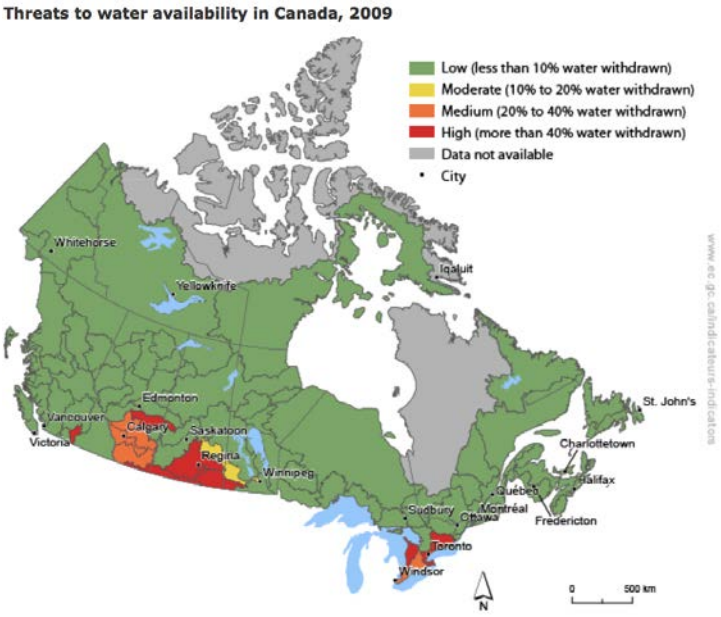
Element 3.12.5 of the 2013–16 Canadian sustainable development strategy refers to the need to maintain statistical measures of water use and water availability. These statistics are required to support of Target 3.12 of the strategy, Water Resource Management; facilitate sustainable water resource management through the collection of data; and the development and dissemination of knowledge from 2013–16**.** Target 3.12 falls under Theme II of the strategy, Maintaining Water Quality and Availability.

The indicator of water availability in Canada (see figure 6) measures the ratio of water available in watershed basins to the quantity of water used each year. The indicator is currently only available for the year 2009. Data on the quantity of water used come from Statistics Canada's Water Use Account, which has been structured specifically to provide estimates of water use by watershed basin.[21] Data on water availability are calculated by the Ministry of the Environment using data from Canada's hydrometric monitoring network. They essentially measure streamflow in major rivers.[22]

[21] Strictly speaking, the data come from three separate surveys conducted by Statistics Canada covering water use in agriculture, mining, manufacturing, electric power production, and drinking water treatment plants. For the purposes here, these surveys are considered to be part of the Water Use Account.

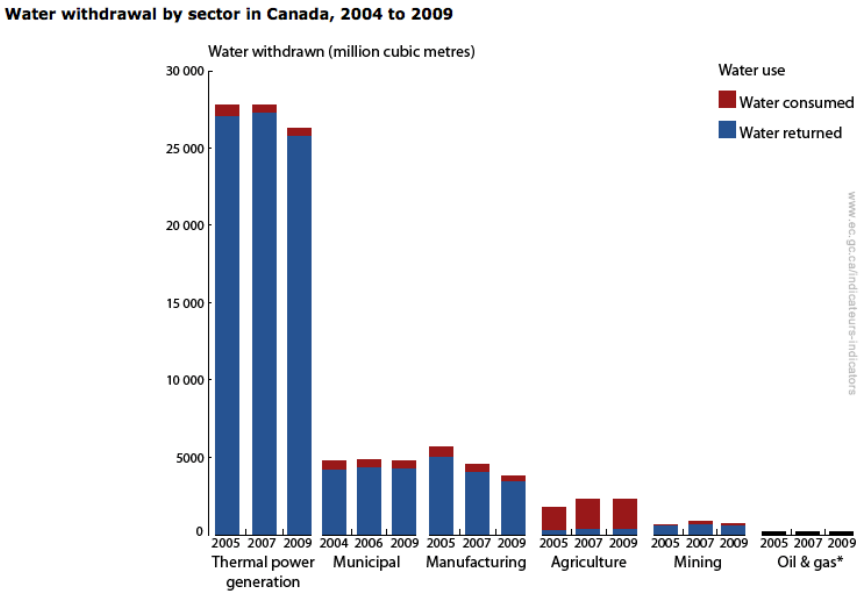
[22] Statistics Canada's Water Resource Account is not currently used as the source of the water availability data for this indicator, even though it could be. Consideration will be given in the future to doing so.

**Figure 6. Indicator of Water Availability in Canada**




The indicator of *water withdrawal and consumption by sector* (see figure 7) shows the quantity of water withdrawn by major sectors of the economy. The data for agriculture, mining, manufacturing, and thermal power generation are taken from Statistics Canada's Water Use Account.[23]

**Figure 7. Water Withdrawals and Consumption by Sector**




[23] As above, these data in fact come from three surveys conducted by Statistics Canada. For the purposes here, these surveys are considered to be part of the Water Use Account.

Professor Steven Renzetti of Brock University in St. Catherines, Canada, has made extensive use of data from the Water Use Account in a series of academic articles stretching back to the 1990s. Renzetti's work focuses mainly on understanding determinants of water use in the manufacturing sector through the use of various econometric models. The industrial classification used in the Water Use Account makes it straightforward for data from the accounts to be integrated into such models. In a recent study,[24] Renzetti and colleagues used 2005 data on industrial water use to examine firms' water recirculation behavior. They concluded that provincial water abstraction fees[25] as well as municipal water prices could be effective instruments in confronting industrial water users with the social opportunity costs of their water-related decisions and, thus, promote more efficient water uses, including internal water recirculation. Three factors suggested that provincial abstraction fees might be the most effective policy instruments. The first is that all provinces already have legislative frameworks that permit abstraction fees. Second, most manufacturing water use is self-supplied and, thus, is liable to be responsive to changes in abstraction fees. Third, all provinces (with the exception of British Columbia) currently have their abstraction fees set quite low.

The Ontario Water Technology Acceleration Program exists to support the province of Ontario's goal to be a world water technology hub. It makes private sector experience available to help water technology entrepreneurs, utilities, and investors make connections and find financial and other resources. The program uses data from Statistics Canada's Water Use Account[26] to track spend on investment in drinking water infrastructure. Renewal of this infrastructure is a policy priority in Ontario because much of it is old and in need of replacement to ensure long-term viability of supply.

The Conference Board of Canada is undertaking a thorough analysis of Canada's "progress" relative to other developed countries across six domains: economy, society, innovation, environment, health, and education. In each domain, indicators are used to track how Canada is doing in specific areas. Data from the Water Use Account are used in the indicator that tracks progress in water withdrawals (see figure 8).

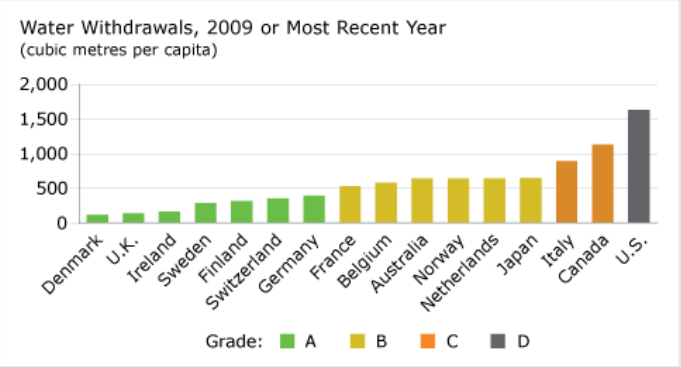
According to the Conference Board, Canada ranks 15th out of 16 peer countries, earning a "C" grade on water withdrawals. Canada's water withdrawals are nearly double that of the 16-country average, with the industrial sector being Canada's largest water user. The Conference Board argues that excessive water withdrawals in Canada can be attributed to the lack of widespread water conservation practices and water pricing that does not promote efficiency.

[24] J. Bruneau, S. Renzetti, and M. Villeneuves, "Manufacturing Firms' Demand for Water Recirculation," *Canadian Journal of Agricultural Economics* 58 (2010): 515–530.

[25] Fees charged by provincial governments to firms for the right to extract water for their own use.

[26] As above, these data come from one of the water use surveys conducted by Statistics Canada (Drinking Water Treatment Plant Survey), which, for the purposes here, is considered to be part of the Water Use Account.

**Figure 8. Conference Board of Canada Water Withdrawals Indicator**




### *Canada, Account 3 – Energy Use Account*

The users and uses of the Energy Use Account are identical to those for the Greenhouse Gas Emissions Account (account 2) noted above.

### *Canada, Account 4 – Mineral Resource Account*

The Canadian Centre for the Study of Living Standards (CSLS) uses data from the Mineral Resource Account to measure one element (natural resource wealth) of its Index of Economic Well-Being (IEWB). The conceptual framework underlying the Index of Economic Well-being is based on two main ideas. First, economic well-being has multiple dimensions and an index should reflect that fact by aggregating measures of the various domains of economic well-being. Second, an index of economic well-being should reflect the fact that individuals differ in the relative weights they assign to the different domains of economic welfare. In order to be useful to all individuals irrespective of those value differences, an index of well-being should make value judgments as explicit and transparent as possible.

The most frequently cited indicator of economic well-being is per capita GDP. GDP measurement is essential for many important public policy purposes, such as macroeconomic demand management and public finance. However, GDP accounting omits consideration of many issues—leisure time, longevity of life, asset stock levels, income inequality, and so on—that are important to individuals' economic welfare. Economic well-being is multidimensional; per capita GDP reflects only one aspect of it, namely a society's output per person.

In accordance with the conceptual framework developed by Lars Osberg,[27] the IEWB is a composite index comprised of four domains of economic welfare:

[27] Lars Osberg, "The Measurement on Economic Well-being," in *Approaches to Economic Well-being*, ed. David Laidler, vol. 36, MacDonald Commission (Toronto: University of Toronto Press, 1985), http://www.csls.ca/iwb/macdonald.pdf.

- Per capita consumption
- Per capita wealth
- Economic equality
- Economic security

These four domains reflect economic well-being in both the *present* and the *future*, and account for both average access to economic resources and the distribution of that access among members of society.

Overall, the CSLS finds that the IEWB rose 25.4 percent from 1981 to 2010, for a compound growth rate of 0.78 percent per year. This means that the growth rate of the IEWB was lower than that of GDP per capita, the most widely used metric of living standards. Real GDP per capita in Canada over the same period advanced 46.3 percent (1.32 percent per year), 20.9 percentage points greater than the percent growth of the Index of Economic Well-being.

Growth in the index of per capita consumption domain led the increase in the overall index. The per capita consumption index increased 215.5 percent over the period. The index of the per capita wealth (to which data from the Mineral Resource Accounts contribute) also increased (by 72.5 percent).

The index of the economic equality fell by 23.6 percent and the index of the economic security declined by 23.3 percent, suggesting that gains in economic well-being are not being equally shared.

Overall, the increase in economic well-being in Canada over the 1981–2010 period has been driven by the dramatic increase in per capita consumption and wealth. The increases in the wealth index were led by increased values of produce and human capital. The value of natural capital remained relatively unchanged over the period.[28]

In a policy comment related to the IEWB and similar efforts to move "beyond GDP," the Canadian Certified General Accountants Association noted that:

> *If GDP [per capita continues to be] one of the main indicators to guide economic interventions, then credit expansion may be chosen by policy-makers as a means to increase aggregate demand. Credit expansion may lead to increased levels of household consumption of durable goods (such as cars) and thus higher levels of GDP. This, in turn, may be naturally interpreted as an improved level of living standards.*

[28] It is important to note that the natural capital wealth figures published in the Mineral Resource Account by Statistics Canada are in current dollars. The CSLS converts these current dollar estimates into constant dollar estimates for the purposes of compilation of the IEWB. This is why the latter shows natural capital wealth as essentially flat while Statistics Canada's figures indicate very large increases in natural capital wealth for the same period.

> *However, the increased number of cars may lead to traffic congestions, amplified commuting time and certain level of environmental degradation that may be viewed as "regrettable" consequences. If the level of living standards is measured by the IEWB, the expansion of household consumption accompanied by increased commuting time and environmental degradation may yield no improvement in the IEWB, which accounts for both consumption flows and regrettable expenses. In short, the policy measure that improves living standards under one set of measurements may bring contrasting and varying results under alternative measurement frameworks*.

In an effort similar to that of the CSLS, the Canadian Index of Wellbeing (CIW), based at the University of Waterloo, also offers a well-being index as an alternative to GDP as a measure of the progress of Canadian society. Like the CSLS' Index of Economic Well-Being, the CIW makes use of data from Statistics Canada's Mineral Resource Account in its Viable Metal Reserve Index (see figure 9). The index is the unweighted average of individual indexes for gold, silver, molybdenum, nickel, lead, copper, and zinc.[29] The CIW notes:

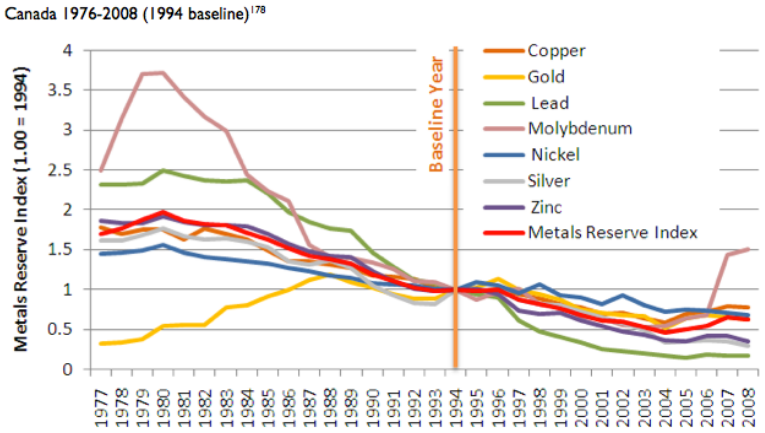
> *The Metals Reserve Index is universally declining [from 1977 to 2008]. While in the last few years the rate of decline has slowed and for now appears stable, reserves are at or near historic lows for virtually all metals. This is despite rising prices, which, as for other extractive industries, determine which reserves are economically viable. Mining has been going on in Canada for many decades now and most of the large and easily accessible deposits have been depleted. In fact, many trends are emerging globally to suggest that metal and mineral reserves are in decline and that mining companies need to use ever greater amounts of water and energy to access those that remain. For the time being, the declining reserves in Canada are balanced through international trade from developing countries.*

The CIW has received considerable media attention in Canada. In an editorial,[30] the *Toronto Star* (one of Canada's major newspapers) commented that

> *In [the latest] index, which looks at changes from [2008 to 2010], Canadian economic output dropped 8.3 per cent, but was beginning to show signs of a slow recovery two years later. Much more sobering, however, is that the wellbeing index fell by fully 24 per cent, "and shows no sign of recovery to even the modest gains made up to 2008."*

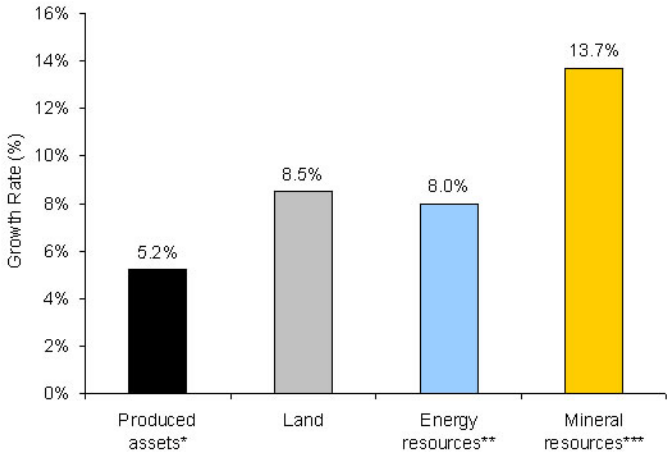
[29] The individual indexes are calculated using data from the physical Mineral Resource Stocks compiled by Statistics Canada with 1994 as the base year.
[30] Editorial, *Toronto Star*, October 23, 2012.

**Figure 9. Canadian Index of Wellbeing: Viable Metal Reserves Index**




The Canadian Intergovernmental Conference Secretariat is a federal agency whose mandate is to provide administrative services required for the planning and the conduct of senior-level intergovernmental conferences. It used data from the Mineral Resource Account in a brief it prepared for a ministerial-level conference on energy and mines in 2012. The brief was titled "Assessing the Economic Impact of the Energy and Mining Sectors in Canada" and served to provide an overview of the contribution of energy and mining to various aspects of Canada's economy. Data from the Mineral Resource Account were used to put the growth in the value of natural capital in the broader context of changes in wealth in Canada (see figure 10). The fact that the Mineral Resource Account are compiled using valuation methodologies that are consistent with the *System of National Accounts* allows the direct comparison of growth in the value of energy and mineral resources with land and produced assets, both of which are measured directly in the national accounts.

**Figure 10. Average Annual Growth in Various Asset Categories, 2000–2011**




* Represents the value of produced wealth across Canada, including structures, machinery & equipment, consumer durables and inventories.
** Includes economically recoverable reserves of crude oil, natural gas, crude bitumen and coal (i.e. the portion of Canada's total stock that is known to exist with a high degree of certainty and that can be profitably extracted today).
*** Includes economically recoverable reserves of gold, iron, copper, nickel, lead, zinc, molybdenum, uranium, diamonds and potash.

As noted above in relation to the Water Use Account, the Canadian Ministry of the Environment has the responsibility for defining the Federal Sustainable Development Strategy for Canada. In the strategy for 2010–2013, the ministry made use of data from the Mineral Resource Account31 to show the economic importance of mineral resources to the Canadian economy. The strategy notes:

> *Canada's prosperity and well-being are linked to the strength of its resource economy and natural environment. Climate change initiatives should consider the economic importance of sectors such as energy (oil and natural gas), agriculture, forestry, fisheries, water resources, and mineral resources. In 2008, natural resources (timber, energy and minerals) contributed 22% to Canada's total wealth. The value of these natural resources rose 45% to $1,723 billion in the same year.*

It goes on to note that "the main challenge is to meet the energy needs of [Canada's] growing economy while achieving the important goal of reducing greenhouse gas emissions. On the ground this means making *tradeoffs"* (emphasis added).

The fact that the data from the Mineral Resource and Energy Use Accounts are comparable with the data on the value of produced wealth from the national accounts means that evaluating these trade-offs on the basis of statistical evidence is easier than it would be otherwise.

### *Canada, Account 5 – Energy Resource Account*

The users and uses of the Energy Resource Account are identical to those for the Mineral Resource Account (account 4) noted above.

### *Canada, Account 6 – Water Resource Account*

As is the case with the Mineral Resource Account (see above), the Canadian Index of Wellbeing makes use of data from the Statistics Canada's Water Resource Account in its report on well-being in Canada. In this case, the data are incorporated "as-is" into the report as one of the indicators used to measure the environmental dimension of well-being: water yield for southern Canada. The report notes that

> *With large lakes, extensive wetlands, numerous glaciers and mighty rivers, at first glance, Canada appears to have lots of freshwater. However, when it comes to freshwater, it is not a matter of quantity alone, but quantity in conjunction with space and time. Since water is not always available when and where it is needed, nor is nature always factored into the environmental flow requirements, the stock of water is critical to the wellbeing of Canadians. Water is essential not only for life and basic health (sanitation and drinking water), but indeed essential to all aspects of wellbeing.*

[31] Note that the strategy also drew from the Energy Resource and Timber Resource Accounts in making the case for the importance of resources to Canadian economy.

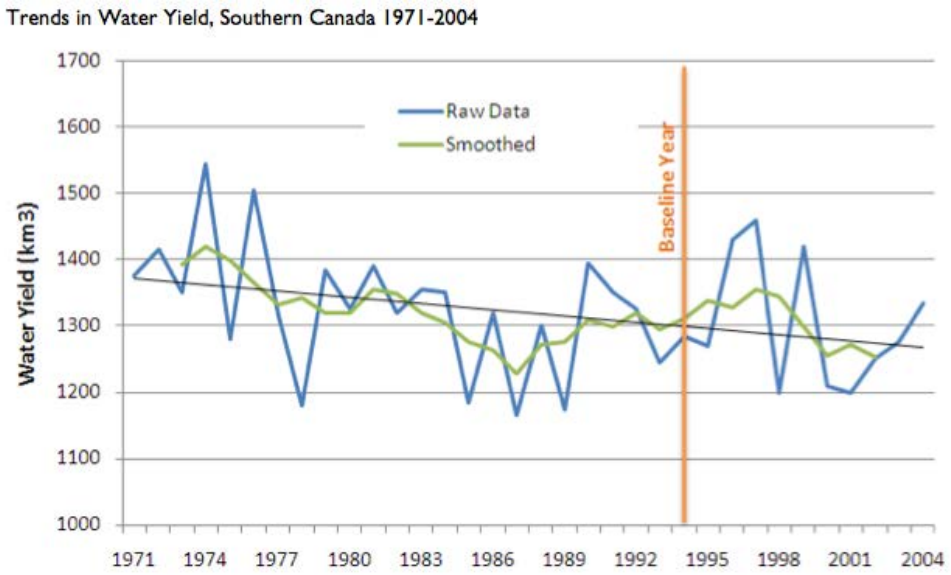
*Food, transportation, energy, clothing, recreation, and biotic resources are all intimately dependent upon water supplies.*

Statistics Canada's Water Resource Account shows that over the course of the past 30 years the supply of water in Southern Canada has decreased some 8.5 percent (see figure 11), which represented an average loss of 3.5 cubic kilometers per year, the equivalent of all of Canada's residential water use for a year.

One of the valuable features of environmental accounts is consistency in measurement over long time series and this value is clearly seen in this indicator. Trends in water yield manifest themselves only slowly, so long, consistent measurement is required if these trends are to be revealed.[32]

A second valuable feature, also demonstrated by this indicator, is accessibility to the general public. The data that lie behind the Water Resource Account have long been available from the Water Survey of Canada, but they are extremely detailed and difficult for the uninitiated to comprehend and use. Their compilation into an aggregate measure of water yield in the Water Resource Account takes this complexity and distills it down to a level at which it is comprehensible to a wide variety of users.

**Figure 11. Water Yield for Southern Canada**




### *Canada, Account 7 – Timber Resource Account*

As with the Mineral Resource and Water Resource Accounts (see above), the Canadian Index of Wellbeing uses data from the Timber Resource Account in its report on well-being

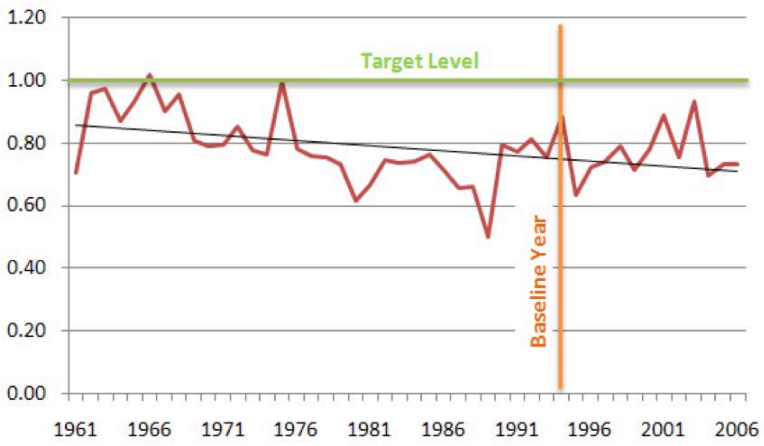
[32] It is worth mentioning that the Water Resource Account is currently an experimental account at Statistics Canada. Discussion is underway to find resources to allow its permanent compilation.

in Canada. The data are used in the compilation of the "Timber Sustainability Index." As the report notes:

> *Sustaining Canada's forests means that the annual harvest (and deforestation) in cubic metres should not exceed the annual growth in cubic metres of standing timber while the reproductive capacity and resilience of the forest ecosystems stays equal. For a renewable resource like timber, a constant stock size indicates that annual harvesting and other losses, including losses due to fire, insects and other industrial development, are offset by annual growth. Sustaining Canada's timber resources is critical to the forest industry, local economies and to Canada's carbon balance sheet.*

The Timber Sustainability Index is measured as the ratio of the annual growth in timber volume (taken from the Timber Resource Account) to the annual losses of timber due to harvest, fires, pests, and other sources of decline (taken from other data sources). The index (see figure 12) shows that timber resources in Canada, as measured by the index, have been on an unsustainable trend since 1961. In other words, the rate of growth of timber volume has been insufficient to compensate for the loss of timber volume due to harvesting and other factors.

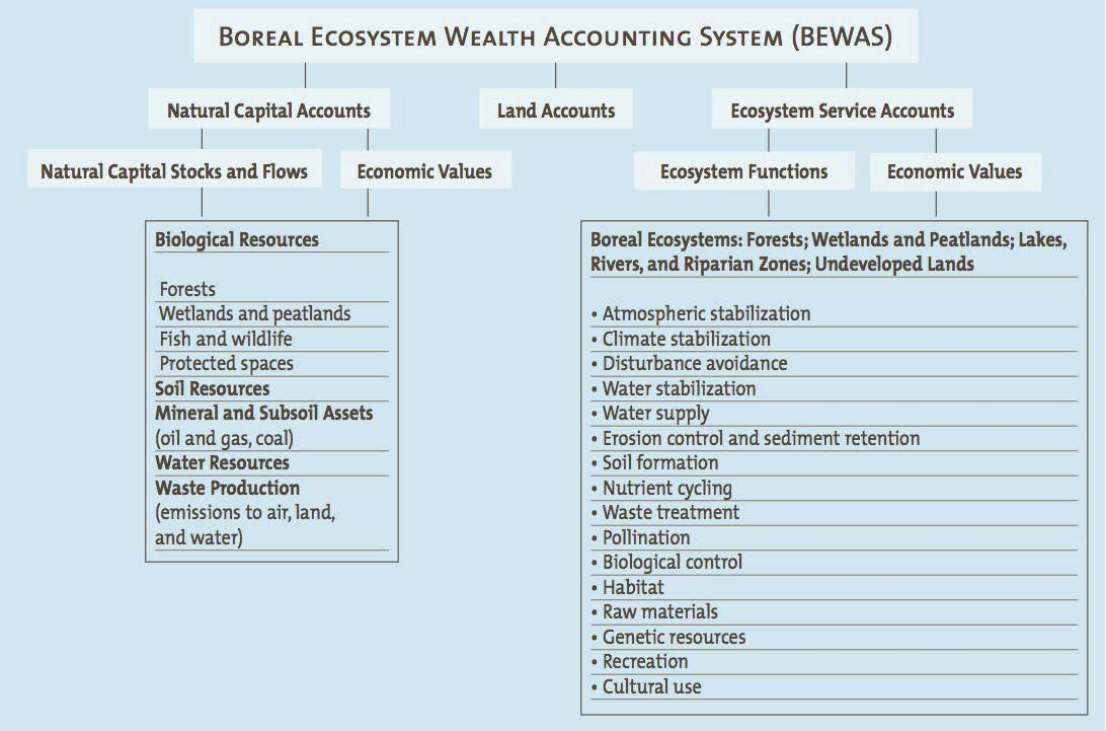
**Figure 12. Canadian Index of Wellbeing: Timber Sustainability Index**




In an exhaustive study of the value of natural capital in Canada's boreal forest, the not-for-profit Pembina Institute used concepts and structure from the Timber Resource Account to evaluate the full value of the boreal forest to Canada's economy.[33] The "Boreal Ecosystem Wealth Accounting System" (BEWAS) used in the study is shown in figure 13. As can be seen, it is a comprehensive system that accounts for all natural capital stocks and flows associated with the boreal forest.

[33] The report did not use actual data from the accounts because the accounts are not broken down by forest region.

**Figure 13. Boreal Forest Accounting System**




The authors of the study—who admit that their "attempt at even a partial construction of a BEWAS for the boreal region is ambitious and daunting, and its completion is years away"—went to considerable lengths to ensure that their accounting system was fully compatible with the UN System of Environmental-Economic Accounting (SEEA) and with Statistics Canada's environmental accounts. This demonstrates a key feature of environmental accounts: the creation of consistent statistics. Even though the authors were not able to use data directly from Statistics Canada's accounts, the existence of the accounts gave them a conceptual and structural reference point for their work. As a result, their findings are compatible with Statistics Canada's own findings related to Canada's natural capital.

Professor Peter Victor of York University in Toronto, Canada, used data from the Timber Resource Account for the forestry module of his LowGrow model of the Canadian economy. The model was used as the policy simulation tool in his influential book Managing Without Growth: Slower by Design, Not Disaster.34 The computer model used in the book can be accessed here. Its basic structure is shown in figure 14.

Victor uses LowGrow in an extensive discussion of the transition toward a low/no-growth economy. He shows how "important economic and social objectives can, in principle, be met in a rich country without relying on economic growth." Such a development path is, in Victor's view, desirable in part because "there is mounting evidence that higher incomes

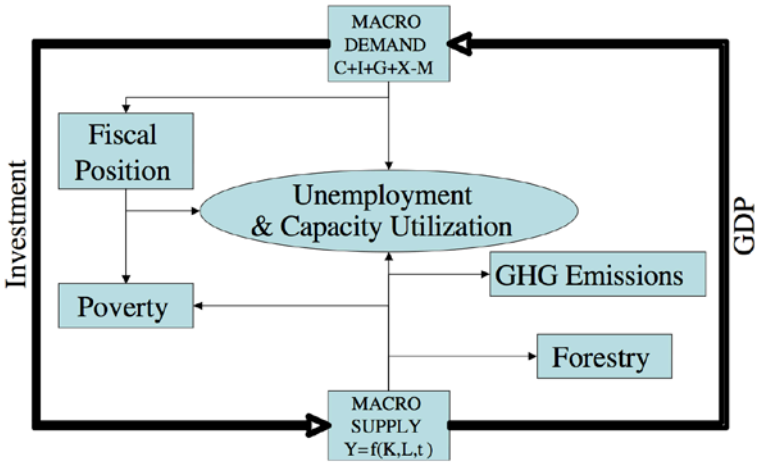
[34] Peter A. Victor, *Managing Without Growth: Slower by Design, Not Disaster* (Cheltenham, UK and Northampton, MA: Edward Elgar Publishing, 2008).

and increased consumption beyond levels [already] far surpassed in rich countries do not increase happiness." Furthermore, he notes "the world's economies are encountering biophysical limits that are showing up in many ways. The case for economic growth in poor countries remains strong and … [therefore] … it is imperative that rich countries deliberately, systematically and thoughtfully slow down" (Victor 2008, 222–223).

Victor's book on managing without growth is one of the works that has spawned the so-called "degrowth movement." He was a keynote speaker at a major international conference on the topic held in Montreal, Canada, in 2012. See also, for another example, this interview with him by the Capital Institute.

Since publishing *Managing Without Growth*, Victor has focused on the development of a new, more comprehensive macro model of the Canadian economy that makes more extensive use of flow data from Statistics Canada's environmental accounts. He comments that "the fact that [the environmental accounts data are] presented using NAICS[35] makes it very easy to integrate it into an economic model."[36]

**Figure 14. Simplified Structure of Victor's LowGrow Model**




### *Canada, Account 8 – Land Use/Cover Account*

The Canadian Federation of Municipalities is a nongovernmental organization that represents the interests of cities and towns. It produces a Quality of Life Reporting System in which one component is an assessment of the ecological footprints of Canadian municipalities. Data on economic land uses from the Land Use/Cover Account were used in the study. The study found that the average Canadian consumes 7.25 hectares of land and sea to sustain his/her needs. That means it takes 7.25 hectares of land and sea throughout the world to support each Canadian. Calgary, Edmonton, and Halton have the highest municipal footprints while Greater Sudbury and Niagara Regional Municipality have the

[35] NAICS is the acronym for North American Industrial Classification System. It is the international classification of industries that is used in the *System of National Accounts*.
[36] Peter A. Victor, personal communication, January 27, 2014.

lowest. Footprints range from as low as 6.87 hectares/person in Greater Sudbury to a high of 9.86 for Calgary (CMA). The primary difference is due to consumption expenditure levels and the kind of energy consumed.

The authors of the report noted that Statistics Canada's environmental accounts data are not available at the level of municipalities and recommended that "Statistics Canada begin accounting for material and energy flows at the provincial and municipal scale, as they do at the national level." Practically speaking, this is not likely to be possible. Statistics Canada, like nearly all national statistical agencies, is subject to legislation that prevents it from revealing data that could pertain to a specific individual or company. Since material and energy flows can be dominated at the municipal level by a few large entities (for example, a pulp mill dominating water use in a small city), official statistics—especially those pertaining to businesses—are not usually reported at the level of municipalities.[37]

This points to one of the limitations of environmental accounts that needs to be borne in mind by those wishing to use them for policy analysis. They are generally not well suited to analysis at the local level; they are intended, rather, to measure phenomena at the broad regional (state or province) or national levels. This limitation must be communicated to potential users so that their expectations regarding the usefulness of environmental accounts are not unduly inflated.

### *Canada, Account 9 – Solid Waste Account*[38]

The Canadian Index of Wellbeing uses data from the Solid Waste Account in its report on well-being in Canada. The data are used in the compilation of the "Per Capita Waste Disposal and Diversion Rates." As the report notes, there is a general upward trend in the quantity of solid waste generated in Canada, though an increasing share of this waste is diverted from landfill and sent for recycling or composting.

The Recycling Council of Ontario has a mission to inform and educate all members of society about the generation of waste, the avoidance of waste, the more efficient use of resources, and the benefits and/or consequences of these activities. It is involved in policy, education, and project work around the issues of consumption, waste generation, reduction and diversion, and recycling.

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[37] There is another reason why official statistics are often not released for small spatial units. Due to the nature of sample surveys, which are used to collect the vast majority of official statistics, the accuracy of estimates for small units is often unacceptably low. This is because survey samples sizes are designed to yield results of acceptable quality only at the regional or national level. Though samples could be designed to yield estimates for smaller units, this is not typically done. First, the cost of conducting surveys with very large samples is prohibitively expensive. Second, even if accurate estimates could be produced for small units, confidentiality will often preclude their release in any case, taking away any justification there might have been for paying for a large sample.

[38] Strictly speaking, the Solid Waste Account is not part of Statistics Canada's environmental accounts. Rather, it consists of two surveys (one of businesses and one of governments) that collect statistics on quantities of solid waste generated in Canada. This "account" is included in this report because the survey shares many of the characteristics of an account.

The council uses data from the Solid Waste Account to inform the public about the amount of waste generated in Canada and in its policy analysis. For example, it referred to data from the account in its comments on proposed new legislation governing the management of solid waste in the province of Ontario. The council noted that Ontario's 2010 solid waste diversion rate of 30 percent, as measured in the Solid Waste Account, is well below the provincial government's 2004 policy target of 60 percent diversion.

The Ontario Ministry of the Environment, for its part, has used data from the Solid Waste Account in developing the policy argument for the its proposed new legislation on solid waste management in the province. In its waste reduction strategy, the ministry noted that progress on recycling in Ontario is stalled well short of the 60 percent diversion goal:

> *Ontarians generate about 12 million tonnes of waste every year. However, Ontario's overall recycling rate has hovered around 25% for the past decade. This is because diversion of many wastes is more expensive than sending [them] to landfill ... Once a leader in diversion, compared to other provinces, Ontario's current diversion rate puts [the province] in the middle of the pack.*
>
> *[Ontario has] made good progress increasing recycling in the residential sector—about 46% of residential waste is diverted from landfill. This is mainly the result of municipal activity, including the residential Blue Box program, municipal hazardous or special waste recycling initiatives and programs to divert household organics ("Green Bin"). Diversion programs for used tires and waste electronics have also helped increase recycling efforts.*
>
> *The non-residential sector generates almost 60% of our waste yet overall recycling rates are low (13%).*

Many of the data used to back up the above statements come from the Solid Waste Account, demonstrating the value of the consistent time series data that come from environmental accounts. Without long time series, policy makers will not know when current policy targets are not being met and, therefore, when it is time to adopt a new policy approach.

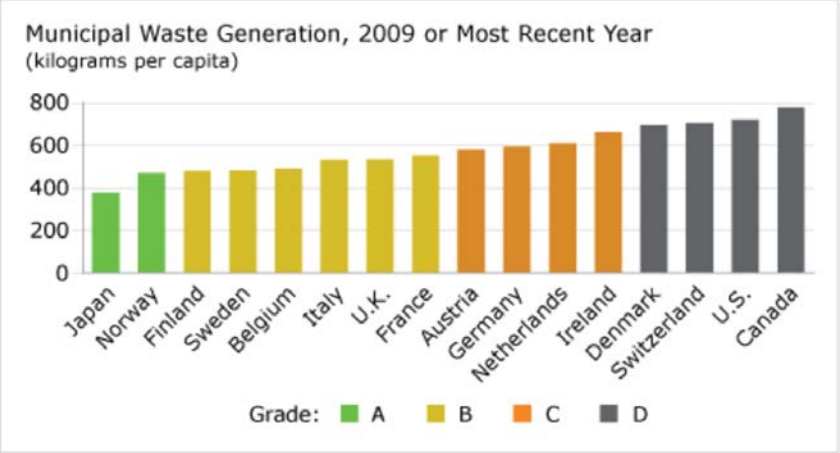
As noted above under the Water Use Account (account 2), the Conference Board of Canad***a*** is undertaking an analysis of Canada's "progress" relative to other developed countries across six domains: economy, society, innovation, environment, health, and education. In each domain, indicators are used to track how Canada is doing in specific areas. Data from the Solid Waste Account are used in the indicator that tracks progress in municipal waste generation (see figure 15).

According to the Conference Board, Canada ranks last out of the 17 countries compared and gets a "D" grade on the municipal waste generation report card. Canada produced 777 kilograms per capita of municipal waste in 2008, twice as much as the best performer, Japan. Canada's municipal waste generated per capita has been steadily increasing since 1990.

The Conference Board report notes that the quantity of municipal waste generated per capita has been rising in most member countries of the Organisation for Economic Co-operation and Development.. In 1995, for example, the average amount of municipal waste generated by the 17 countries ranked in its study was 536 kilograms per capita. By the late 2000s, this had increased to 578 kilograms per capita. Some of Canada's peer countries have, however, managed to keep the amount of municipal waste generated per capita steady, despite economic growth. Between 1990 and 2007, Japan sustained its municipal waste generation at about 400 kilograms per capita, while Norway managed to reduce its per capita volumes of disposable solid waste.

This analysis points to another advantage of environmental accounts: comparability across nations. Because solid waste accounts are compiled using compatible methods across countries, comparisons such as that done by the Conference Board can be trusted to reveal real differences in inter-country performance. Revealing these differences is one way for policy makers—and policy commentators such as the Conference Board—to identify areas where national action is required.

**Figure 15. Conference Board of Canada Municipal Waste Generation Indicator**




ECO Canada is a nongovernmental organization that specializes in providing information related to environmental jobs, training, and certification. It hosts Canada's largest environmental job board and provides a wide variety of resources to help professionals explore, find, and advance their environmental careers.

In a study of the solid waste management industry, ECO Canada used data from the Solid Waste Account extensively to look specifically at employment in this industry. Because the Solid Waste Account does not provide data on employment in the waste management industry, ECO Canada conducted its own employment survey. The Solid Waste Account data were used both as background for this survey and as information to help design it. The survey estimated that the current size of the solid waste management (SWM) industry is likely in excess of 70,000 employees. The survey concluded that there were approximately 59,869 private sector employees and 9,354 public sector employees.

Based on the survey, ECO Canada estimates that SWM employment over the next three years is expected to grow by an annual compound rate of 6 percent. Over 4,000 new SWM employees will be required, with the growth by job classification varying widely—80 percent of employers expect increases in the number of laborers (45 percent) and operators (35 percent), while only 14 percent of employers expect higher management positions to grow.

Based on its experience in designing and conducting the survey, ECO Canada recommends that a consistent occupational nomenclature for the SWM industry be added to Canada's National Occupational Classification (NOC) At the moment, the occupations related to this industry are not well defined in the Canadian NOC. Given the changing nature and requirements of the SWM workforce, ECO Canada argues that labor shortages and education skill gaps within the sector will be better understood if a clearer classification was in place.

The point made by ECO Canada is valid and points to the fact that, even in countries with advanced programs of environmental accounting, there are still improvements to be made in terms of producing consistent, comparable environmental data for policy makers and analysts.

### *Canada, Account 10 – Environmental Protection Expenditures Account*[39]

In a significant report intended to help shape Canada's policy direction across a range of issues of national importance, the Institute for Research on Public Policy addressed, among other concerns, the need to preserve natural capital. The author of the chapter on natural capital, Professor Nancy Olewiler from Simon Fraser University in Vancouver, Canada, made use of data from the Environmental Protection Expenditures Account to put the hypothetical costs of preserving an additional 100 million hectares of land on top of the 82 million that were protected in Canada at the time of the report (2007). She calculates that the cost of purchasing land to set aside in protected areas might amount to $CAN8 billion for a onetime acquisition. This is of the same order of magnitude as the $CAN7.8 billion spent by governments and businesses in 2002 for environmental protection.

It is worth noting that several new national parks have been created in Canada since the time of the report and more are planned. Whether Olewiler's analysis had any influence on these decisions is not known.

The Canada West Foundation, a think tank with a broad agenda, referred to results from the Environmental Protection Expenditure Account in an opinion piece arguing that "going

[39] Strictly speaking, the Environmental Protection Expenditures Account is not part of Statistics Canada's environmental accounts. Rather, it consists of a survey that collects statistics on activities related to environmental protection in the Canada business sector (environmental protection expenditures of governments and households are not currently measured). This "account" is included in this report because the survey shares many of the characteristics of an account, aside from sectoral comprehensiveness.

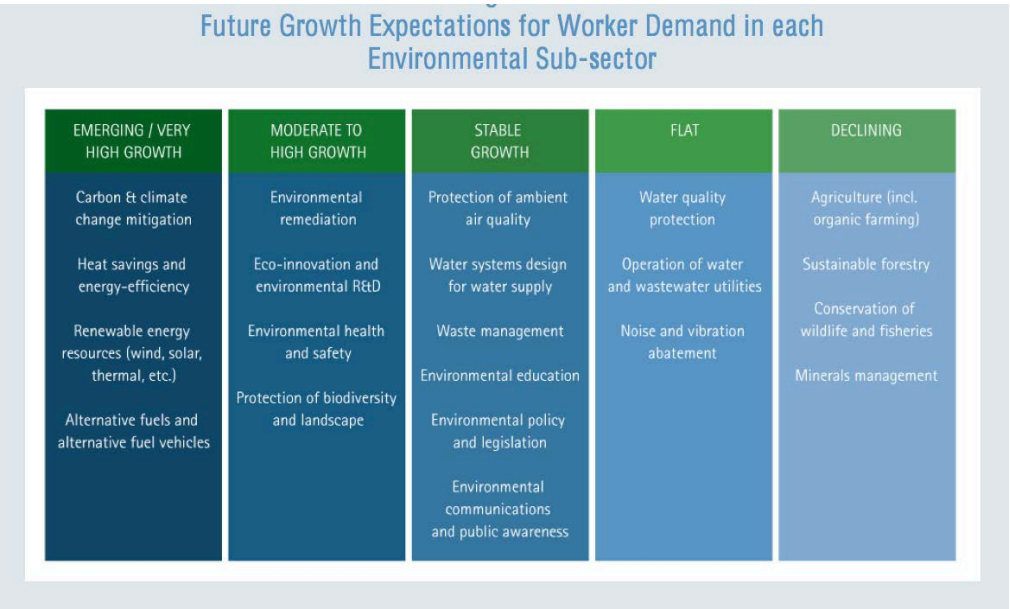
green" is an inevitable trend. The foundation notes that the economy is already capitalizing on the need for environmental protection (citing data from the account) and that politically there is also an important shift in thinking. It concludes, "the future is going green—that is the reality forged by these patterns of behaviour. Those that argue over the technicalities of whether or not climate change can be prevented miss the point that a public mindset change has already happened. We need to stop seeing red over the debate about going green because right or wrong green is here and now."

The value of credible environmental accounting data, in this case relating to the size of environmental protection spending in the economy, in allowing think tanks to make these kinds of policy arguments is obvious. Because Statistics Canada is a trustworthy source of information and because the Canada West Foundation knows it can rely on the environmental accounts data to be produced year after year, they have no reason to hesitate in bringing it to bear in their policy advocacy work.

As with the Solid Waste Account (see above), ECO Canada makes extensive use of data from the Environmental Protection Expenditure Account in a report looking at employment in the broad environmental sector in general. The report's findings are summarized in a table that shows future employment demand expectations in different subsectors of the environmental sector (see figure 16).

The value of the consistent and comprehensive data from the Environmental Protection Expenditure Account is in allowing ECO Canada to assess past trends in the business sector and, on that basis, make predictions about the future with a high degree of confidence.

**Figure 16. ECO Canada Summary of Environment Sector Employment Future Demands**



The Canadian Ministry of Natural Resources used data from the Environmental Protection Expenditures Account as one measure of the environmental performance of the Canadian mining sector in a 2010 report on mining sector performance in Canada. It is interesting to note the following conclusion of the report with respect to data availability on the mining sector in general:

> *[I]mportant information gaps … prevent a comprehensive evaluation of the sector's performance over the last decade. In some cases, the data exist but are aggregated inconsistently making comparisons or analysis difficult. In other cases, the absence of quantitative information necessitates the use of qualitative or anecdotal information. Finally, in some instances, there are no agreed–upon metrics to measure performance.*
>
> *Sectors that have invested in performance measurement (e.g., forestry) have seen the benefits that the development of agreed-upon indicators can yield in assessing and managing performance in each of these areas.*

This comment points to the often beneficial relationship that exists between a systematic approach to performance measurement (such as environmental accounting can provide) and the increased available of information. When measurement is undertaken systematically, statisticians are able to adapt their data collection efforts toward the provision of the data needed to feed the system. The opposite, what can be called ad hoc measurement, does not offer this advantage and can lead to continually shifting priorities for data collectors.

In a 2011 report on environmental monitoring in Canada, the federal Commissioner of the Environment and Sustainable Development [40] used data from the environmental protection account to measured business sector spending on environmental monitoring. The commissioner noted that of total spending on environmental protection of $CAN9.1 billion, Canadian business spent about $CAN329 million in 2008 on monitoring.

### *Canada, Account 11 – Environmental Goods and Services Account*[41]

Professors Jennifer Winter and Michael Moore of the School of Public Policy at the University of Calgary, Canada, used data from the Environmental Goods and Services Account in an interesting and thorough critique of the concept of "green jobs." They note that the concept seems to be primarily definitional rather than functional in practice. The range of definitions is large and often depends on the specific nature and objectives of the organization that establishes the definition. Additionally, green jobs typically fall across different traditional industry definitions, making them difficult to quantify consistently.

[40] In Canada, the Commissioner of the Environment and Sustainable Development is part of the Office of the Auditor General of Canada.

[41] Strictly speaking, the Environmental Goods and Services Account is not part of Statistics Canada's environmental accounts. Rather, it consists of a survey that collects statistics on revenues from the sale of good and services that are considered "environmental" in nature. This "account" is included in this report because the survey shares many of the characteristics of an account.

The authors conclude that a better way to track the "greening" of business is by monitoring the evolution of greenhouse gas intensity (see account 1).

### *Canada, Account 12 – Ecosystem Account*

Statistics Canada's Ecosystem Account is experimental and was released for the first time in November 2013. While it is expected that the account will be of considerable use to policy makers and analysts once better established, at the time of preparation of this report it is too early to determine its users and uses.

## Denmark

Denmark's environmental accounts are produced by Statistics Denmark, the national statistical agency.

Most of Statistics Denmark's accounts have long time series. The exception to this is the material flow account, which was not previously prepared by Statistics Denmark but which is mandatory as of 2011 for all members of the European Union as a result of a European Union environmental accounting regulation.[42]

At the moment, approximately two full-time-equivalent staff members are employed in compiling and reporting the environmental accounts. These staff members are involved in regular production activities. In addition one full-time-equivalent staff member is involved in externally funded environmental accounts work on pilot project and research.

Recently a project funded by several ministries in Denmark has started to develop statistics for the environmental goods and services sector. The first results are expected to be ready by the end of 2014 or the beginning of 2015.

All of Denmark's accounts are produced annually and for the nation as a whole with the exception of the Energy Supply and Use Account, which is compiled for the five regions and 99 main municipalities of the country. In all cases, the accounts cover all sectors of the economy.

The main users and uses of Denmark's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 3.

[42] In Europe, the compilation of three accounts (air emissions account, environmental taxes, and economy-wide material flows) is mandated in law under Regulation (EU) 691/2011. The regulation provides a legal framework for the harmonized collection of comparable data from the EU member states and it sets the foundation for adding additional accounts to the statistical law in the near future.

## Summary of Environmental Accounts Compiled, *Denmark*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1990 | 2010 | 0.75 | | Click here |
| **Account 2** | Energy Supply and Use Account | Annual | Subnational (political boundaries) | All sectors | 1966 | 2011 | 0.75 | Prepared for the five regions of the country plus 99 main municipalities | Click here<br><br>Click here |
| **Account 3** | Material Flow Account | Annual | National | All sectors | 2008 | 2011 | 0.5 | | Click here |
| **Account 4** | Environmental Taxes Account | Annual | National | All sectors | 1995 | 2011 | 0.3 | | Click here |
| **Account 5** | Environmental Goods and Services Account | n/a | n/a | n/a | n/a | n/a | n/a | This account is under development. The first results are expected by end of 2014 or the beginning of 2015. | |

Note: n/a = not available; FTE = full-time equivalent

## Highlights of Users and Uses – *Denmark*

### *Denmark, Accounts 1 and 2 – Air Emissions and Energy Accounts*

EMMA is a system of energy and emission models[43] that was developed by the National Environmental Research Institute, Risø National Laboratory, and Statistics Denmark that uses the Danish environmental accounts as inputs for its estimations. It is suitable for answering questions such as, "For a given level of economic output, what emissions will be generated?" and "Given specific targets for emissions or emissions reductions, will these be obtained given the projected economic development and current policies?"

An example of the use of the EMMA system is the modeling of a Danish strategy for reaching the Kyoto Protocol goal by reducing $CO_2$ emissions by 21 percent in 2012 compared to 1990. The specific strategy modeled included a combination of buying international $CO_2$ quotas, energy savings, increased use of renewable energy sources, and the introduction of a carbon tax. Official government targets for economic growth were taken as a "business as usual" scenario (that is, economic growth of 1.4 percent per year without any specific strategy for the reduction of the $CO_2$ emissions). This was used as the reference point for modeling the reduction strategy.

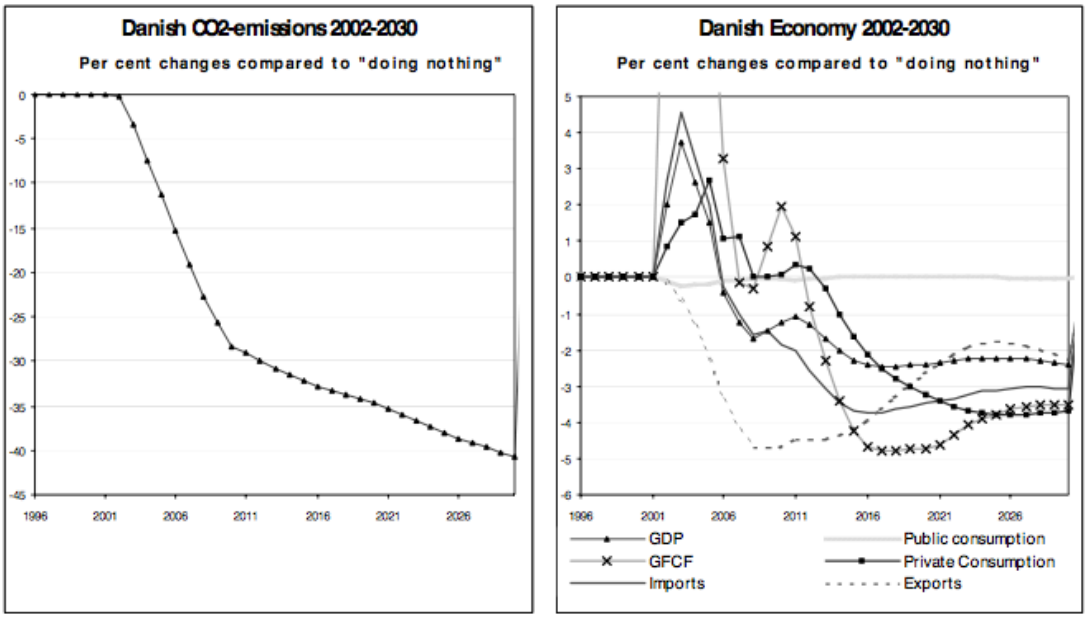
The left graph in figure 17 below shows that the reduction strategy lowers emissions by 40 percent compared to the business-as-usual scenario by 2030. A reduction of this magnitude is necessary in order to keep $CO_2$ emissions within the framework of the Kyoto Protocol. Otherwise, general economic growth causes an increase in emissions.

The right graph in figure 17 shows the reduction strategy's effect on the economy compared to business as usual. It can be seen that most economic variables move upward in the beginning (due to large investments in energy savings, and so on), after which they all fall below the levels where they would have been had the strategy not been implemented. From the middle of the period (2015) the effect up the economy stabilizes. GDP, for instance, lies approximately 2 to 3 percent below GDP of the business-as-usual scenario.

So far, the EMMA system is capable only of creating scenarios that link energy use and $CO_2$ emissions with the economy. However, possibilities exist for extending the models with other submodels that could be used for modeling of other types of emissions, solid waste generation or resource use. However, funding for the implementation of this broader modeling system is lacking for the moment.

[43] EMMA is an acronym for "Environmental and Emissions Model for ADAM." ADAM (Annual Danish Aggregate Model) is a macro-economic model developed by the macroeconomic modeling unit of Statistics Denmark. The model gives a simplified description of the interactions of the Danish economy. It is used by Danish government agencies for macroeconomic forecasting and planning.

Figure 17. Scenario Modeling of Danish $CO_2$ Emissions




Using EMMA and other models, the Danish Energy Agency has created a baseline scenario to 2035 for energy production, energy consumption and energy-related greenhouse gas emissions. The purpose of the baseline scenario is to assess how energy consumption and emissions of greenhouse gases will evolve in the future if no new policies are introduced. Of course, actual energy use and emissions will be influenced by new policy initiatives, so the baseline scenario simply reflects the challenges that future energy policy must address given the current state of the economy and policy.

The Danish Environmental Economic Council is an economic advisory body representing unions, employers, NGOs, and the Danish government. The council prepares an annual report containing analyses on different environmental issues with relevance to the Danish or global economy that make use of the EMMA model. Examples of the findings from its 2013 report relating to road-user charges are given below.

- Road-user charges should be introduced and the current tax on vehicle purchases should be abolished or reduced. These charges should be differentiated according to vehicle type; for example, heavier vehicles, which are more dangerous for other road users, should pay a higher tax.
- If road-user charges are not introduced, the vehicle purchase tax should be converted into an annual car ownership tax that should be differentiated according to vehicle weight.
- Overall, vehicle taxation in Denmark appears to be too high compared to the external cost of vehicle use. Vehicle taxation should, therefore, generally be

reduced in favor of taxation of broader tax bases like income tax or value-added taxes.

- Control of $CO_2$ emission should only be done via taxes on gasoline and diesel.

## Finland

Finland's environmental accounts are produced by Statistics Finland, the national statistical agency.

Most of the Finish accounts are produced annually. Otherwise, they are occasional. The geographic scope of the accounts is in most cases national only; some waste statistics, land use, and hydrological data are available at the subnational level. For the most part, the scope covers all sectors of the economy, though some accounts are produced only for either the government or the business sector.

No detailed discussion of the users and uses of Finland's environmental accounts is possible because nothing more than the basic information on them was discovered through the research for this report. The information that was gathered is summarized in Annex 4.

## Summary of Environmental Accounts Compiled, *Finland*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs | Comments | Weblink |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1995 | 2010 | €15,000 | Covers $CO_2$, nitrous oxide ($N_2O$), methane ($CH_4$), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, $NO_x$, $SO_x$, non-methane volatile organic compounds, ammonia, carbon monoxide, and particulate matter ($PM_{10}$). | Click here |
| **Account 2** | National Greenhouse Gas Emissions Inventory | Annual | National | All sectors | 1990 | 2012 | n/a | Statistics Finland is responsible for the official UNFCCC greenhouse gas emissions inventory in Finland. It is one of only a few national statistical agencies to play this role. | Click here |
| **Account 3** | Water Emissions Account | Occasional | National | All sectors | 1999 | 1999 | n/a | Part of the Waste Emissions Account | Click here |
| **Account 4** | Material Flow Account | Annual | National | All sectors | 1970 | 2011 | €10,000 | | Click here |
| **Account 5** | Waste Emissions Account | Occasional | National | All sectors | 1997 | 2003 | n/a | Measures changes in the volumes of waste, waste treatment methods, and proportions of hazardous waste. The data are classified by industry and waste type and (in some cases) by region. | Click here |
| **Account 6** | Environmental and Energy Taxes Account | Annual | National | All sectors | 1980 | 2011 | €20,000 | | Click here |
| **Account 7** | Environmental Protection | Annual | National | Business | 1992 | 2011 | €100,000 | | Click |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Expenditures Account | | | sector | | | | | here |
| **Account 8** | Timber Resource Account | Occasional | National | All sectors | 1980 | 2003 | n/a | Includes some estimates of non-timber forest uses. | Click here |
| **Account 9** | Environmental Protection Expenditures Account | Annual | National | Business sector and government sector | 1994 | 2010 | €15,000 | | Click here<br><br>Click here |
| **Account 10** | Environmental Goods and Services Sector | Annual | National | Business sector | 2009 | 2011 | €100,000 | | Click here |
| **Account 11** | Hydrological Yearbook | Annual | National | n/a | | | n/a | Monthly hydrological observations are also available. | Click here<br><br>Click here |
| **Account 12** | National Land Survey | Annual | Subnational (political boundaries) | n/a | | | n/a | Produced by the Land Survey of Finland | Click here |

Note: n/a = not available

## France

France's environmental accounts are produced by the Ministère de l'Ecologie, du Développement durable et de l'Energie, the national ministry of the environment, sustainable development and energy.

Most of the accounts are produced annually, while a few are produced either biennially or occasionally. All are produced at the national level only and all cover all sectors of the economy.

No details were discovered regarding the users and uses of France's environmental accounts during the research for this report.

## Summary of Environmental Accounts Compiled, *France*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1990 | 2011 | 0.1 | | Click here |
| **Account 2** | Water Emissions Account | | | | | | | Many statistics on water are produced, but they are not officially considered part of the French environmental accounts. | Click here |
| **Account 3** | Water Use Account | Occasional | National | All sectors | 2003 | 2007 | | This is an experimental account. There are plans for it to be implemented annually in the future. | |
| **Account 4** | Energy Use Account | Annual | National | All sectors | 1990 | 2011 | 0.1 | | |
| **Account 5** | Material Flow Account | Annual | National | All sectors | 1990 | 2011 | 0.07 | | Click here Click here |
| **Account 6** | Waste Emissions Account | Biennial | National | All sectors | 2004 | 2011 | 0.15 | | Click here |
| **Account 7** | Environmental Taxes Account | Annual | National | All sectors | 1995 | 2011 | 0.2 | | Click here |
| **Account 8** | Environmental Subsidies Account | | | | | | | Experimental account developed in 2011 in the context of the Eurostat taskforce on environment-related transfers. Further new development is planned in 2014. | |
| **Account 9** | Environmental Protection Expenditures Account | Annual | National | All sectors | 2000 | 2011 | 1 | | Click here |
| **Account 10** | Other Expenditures Related to the Environment | Annual | National | All sectors | 2000 | 2011 | 0.15 | Covers renewable energy, raw materials recovery, and urban | Click here |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | green spaces. | |
| **Account 11** | Environmental Goods and Services Account | Annual | National | All sectors | 2004 | 2011 | 0.1 | Covers market and nonmarket activities. | Click here |
| **Account 12** | Energy Balances | Annual | National | All sectors | 1970 | 2012 | 1.6 | Excludes overseas French territories. | Click here |
| **Account 13** | Timber Resource Account | | | | | | | A methodological document on forest accounts was released in 2005. A new report will be published with data from 2007 to 2010. | Click here<br><br>Click here |

Note: FTE = full-time equivalent

# Germany

Germany's environmental accounts are produced by the Federal Statistical Office (Destatis), the national statistical agency.

All of the accounts are produced annually except for the Land Use Account, which is produced every four years.

About half of the accounts are produced only at the national level. The other half are produced at the subnational level using political boundaries.

In all cases (where relevant), the accounts cover all sectors.

The known users and uses of Germany's accounts are discussed following the summary table below. The users and uses are summarized in Annex 5.

## Summary of Environmental Accounts Compiled, *Germany*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1995 | 2011 | n/a | | Click here |
| **Account 2** | Water Flow Account | 1991–2001 annually; after 2001, in three-year intervals | National (political boundaries) | All sectors | 1991 | 2010 | n/a | | Click here |
| **Account 3** | Energy Use Account | Annual | National and subnational (political boundaries) | All sectors | 1991 | 2012 | 2 | | Click here |
| **Account 4** | Economy-wide Material Flow Account | Annual | National | All sectors | 1994 | 2011 | n/a | | Click here |
| **Account 5** | Waste Emissions Account | Annual | National and subnational (political boundaries) | All sectors | 1994 | 2011 | n/a | | Click here |
| **Account 6** | Environmental Taxes Account | Annual | National | All sectors | 2000 | 2012 | n/a | | Click here |
| **Account 7** | Environmental Protection Expenditures Account | Annual | National | All sectors | 2000 | 2010 | n/a | | Click here |
| **Account 8** | Forest Account | Annual | National | All sectors | 1993 | 2011 | n/a | | Click here |
| **Account 9** | Land Use Account | Quadrennial | National and subnational (political boundaries) | All sectors | 2000 | 2008 | n/a | Production currently suspended | Click here |

Note: n/a = not available; FTE = full-time equivalent

## Highlights of Users and Uses – *Germany*

### *Germany, Accounts 1, 3, 4, and 9*[44]

In Germany, perhaps more than in any other country, there is an explicit and dynamic link between the German federal government's sustainable development strategy and the environmental accounts compiled by the Federal Statistical Office (Destatis). Most of Destatis' environmental accounts are used in one way or another in monitoring the progress of the strategy's implementation.[45]

The German sustainable development strategy was first established in 2002. Since then, a progress report has been compiled every four years by the government. Its purpose is to highlight existing areas of the strategy in need of adjustment and additional areas that require new action.

A set of 21 indicators is used to monitor progress in achieving the strategy's goals. Quantitative targets are set out for most of the indicators, providing a clear basis on which to assess progress toward meeting the goals of the strategy. The government decides on the indicators and the targets, while the statistical office reports on them, calculates progress toward meeting the quantitative targets, and advises the government on matters of methodology. This indicator reporting is done every two years and Destatis is careful to ensure that its reports are neutral, transparent, and independent.

As can be seen in figure 18, most of the indicators are derived from official statistics in Germany, especially from Destatis's national and environmental accounts. The white numbered boxes in the figure are those indicators that are based on accounting systems (9 out of 21). As can be seen, three of the indicators are derived directly from the environmental accounts and another two are derived jointly from national and environmental accounts. This clearly demonstrates the relevance of the German environmental accounts to this major government policy initiative.

In an interesting and possibly unique example of the interplay between policy and statistics, a section of each quadrennial progress report prepared by the government is devoted to a discussion of the indicators report prepared by Destatis. The government notes that "the Federal Statistical Office makes a valuable contribution that allows for a credible and comprehensible review of the National Sustainable Development Strategy." At the same time, the government "does not embrace all of the statements issued by the Statistical Office."

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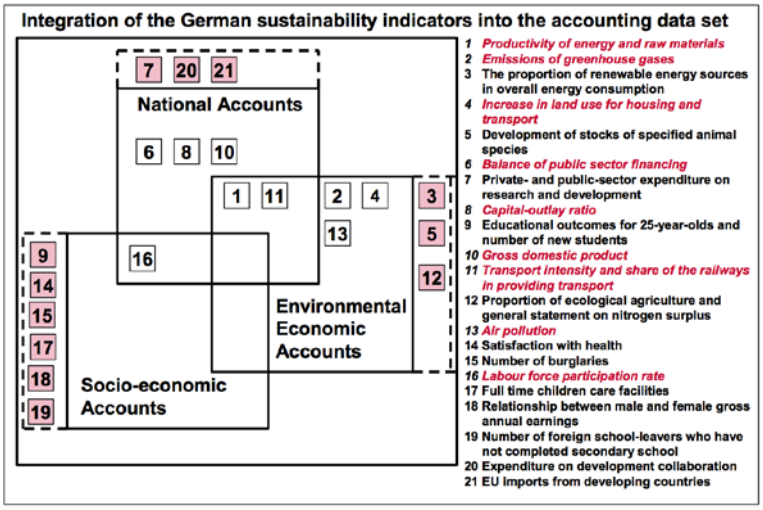
[44] Air Emissions, Energy Use, Economy-wide Material Flow and Land Use accounts.

[45] Of the nine accounts compiled in Germany, four are used in some way in monitoring the sustainable development strategy.

**Figure 18. German Federal Sustainable Development Indicators**[46]




Another interesting aspect of the German strategy is the so-called "golden rules" of sustainability. These rules, which were first articulated in the 2002 sustainable development strategy under the heading "management rules for sustainability," are summarized below. Those for which there is a close relation with Destatis's environmental accounts are marked in green (all of the rules could, in one sense or another, be informed by the accounts).

1. Each generation must solve its own problems and not burden future generations with them. It must also make provisions for foreseeable future problems.

2. Renewable natural resources (for example, timber or fish) should be used only within the bounds of their ability to regenerate. Equally, nonrenewable natural resources (for example, minerals or fossil fuels) should only be used to the extent that their functions can be replaced by other minerals or energy sources.

3. The release of materials into the environment should, in the long run, not exceed the ability of ecosystems to adapt.

4. Dangers and unjustifiable risks to human health should be avoided.

5. Economic changes triggered by technical developments and international competition should be managed to be economically successful as well as ecologically and socially sustainable. To achieve this, policies should be

[46] Karl Schoer, "Policy use of Environmental-Economic Accounting in Germany" (paper presented at the OECD-Latin America and the Caribbean Conference on Environmental Information and Decision Making, , Mexico, November 28–29, 2005).

integrated such that economic growth, high employment, social cohesion, and environmental protection go hand in hand.

6. Energy and natural resource consumption and the provision of transport services should be decoupled from economic growth.

7. Public budgets should take account of intergenerational equity. Federal, state, and district governments should present balanced budgets and should reduce their debts.

8. Agricultural practices should help ensure environmental quality. Livestock should be treated in a way that considers the welfare of the animals and provides consumer protection, particularly concerning health matters.

9. In order to strengthen social cohesion, poverty and social exclusion should be prevented as far as possible.

10. Development in other countries should be supported so that all global citizens may lead a life worthy of a human being. Poverty and hunger reduction should be linked with efforts to promote human rights, economic development, environmental protection and good governance.

### *Germany, Accounts 1, 3 and 4*[47]

An existing econometric model in Germany has been extended using data from the environmental accounts to create the Panta Rhei model that considers environment-economy interactions. A detailed description of the model is found here.

In recent years, the model has been used for studies of the following:

- Renewable energy with a focus on the labor market
- Energy efficiency
- Green information technology ICT
- Material efficiency
- Scenarios for a new German energy policy

With regard to this last study, the German government decided in 2009 to develop a new energy policy and to use scenario modeling to help in its design. The Panta Rhei model has been used to evaluate economic impacts of a long-term shift toward a low-carbon economy. According to the results of the model, a deep cut of national greenhouse gas emissions of more than 80 percent against 1990 levels by 2050 is economically feasible and may even lead to growth in jobs and GDP. Lower energy

[47] Air Emissions, Energy Use, and Economy-wide Material Flow Accounts.

imports and higher energy efficiency and a focus on renewable energy are key drivers. Extending the life of existing nuclear power stations had also been a key driver until the Japanese tsunami of 2011, after which the government abandoned its plans to rely on nuclear power as part of its new energy policy.

# Italy

Italy's environmental accounts are produced by Istat, the national statistical office.

Approximately seven full-time-equivalent staff members are required currently for the annual production and maintenance of the accounts.

All of the accounts are produced annually and all, with the exception of the Environmental Protection Expenditure Account (account 6), are compiled at the national level only.

Highlights of the users and uses of Italy's accounts are discussed following the summary table below. The users and uses are presented in Annex 6.

## Summary of Environmental Accounts Compiled, *Italy*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1990 | 2011 | 1.3 | | Click here<br>Click here |
| **Account 2** | Energy Use Account | Annual | National | All sectors | 1990 | 2011 | 0.75 | | Click here |
| **Account 3** | Material Flow Account | Annual | National | | 1991 | 2010 | 1.2 | | Click here<br>Click here |
| **Account 4** | Environmental Taxes Account | Annual | National | | 1990 | 2011 | 0.6 | | Click here<br>Click here |
| **Account 5** | Environmental Expenditures Account - National Level | Annual | National | All sectors | 1997 | 2010 | 1.7 | | Click here |
| **Account 6** | Environmental Expenditures Account - Regional Level | Annual | Subnational (political boundaries) | | 2004 | 2010 | 1.6 | Compiled at the level of local governments; in particular, regional administrations | Click here |

Note: FTE = full-time equivalent

## Highlights of Users and Uses – *Italy*

### *Italy, All Accounts*

The 2013 ***OECD*** environmental performance review of Italy notes the following issues for Italy. Those with an asterisk (*) are issues to which environmental accounts could, in general, respond. Those to which Italy's existing suite of environmental accounts could respond are marked with a double asterisk (**).

- **Transition to a low-carbon, energy- and resource-efficient economy
- *Managing the natural asset base
- **Improving the environmental quality of life
- Institutional and coordination framework for environmental management
- Environmental permitting, enforcement, and compliance assurance
- **Key environmental and sustainable development initiatives
- Performance evaluation mechanisms
- Promotion of environmental democracy
- **Economic policy and the environment
- **Greening the tax system
- **Environment-related expenditure and investment
- **Expanding environment-related markets and employment
- **Promoting environmental technologies and eco-innovation
- **Environment, trade and development
- Evolution of the policy, legal and institutional framework for water management
- Governance challenges in managing water resources
- Governance challenges in reforming water supply and sanitation services
- **GHG emission performance
- **Policy framework for climate change mitigation
- **Pricing carbon
- **Climate and energy policies
- **Climate and transport policies
- *Climate change adaptation

### *Italy, Account 1 – Air Emissions Account*

The Department of Economics and Management, University of Ferrara, conducted a study integrating input-output and NAMEA[48] tables for Spain and Italy in 1995, 2000, and 2005 in order to address the policy issue of sustainable consumption and

[48] NAMEA is an acronym for National Accounts Matrix including Environmental Accounts, a general term often used by European countries to describe environmental accounts that measure flows of pollutants of one sort or another.

production. The study deals with the so-called "domestic technology assumption"[49] that is used in input-output models and, in particular, the aggregation bias that may result when calculating indirect emissions using different levels of industrial aggregation in the model (16, 30, and 50 industries). Extended input-output analysis provides analyses of the emissions embodied in domestic consumption and domestic production by considering the structure of intermediate inputs and environmental efficiency in each production sector. The findings show that different sectoral aggregations significantly bias the amount of emissions estimated from the "consumption perspective,"[50] though differently in the two countries. The results suggest that special attention must be paid when interpreting the results of extended input-output studies when the sectoral aggregation level is high (for example, 16 industries).

The Fondazione Eni Enrico Mattei prepared a paper investigating the empirical link between air emission intensity and economic growth, using a very large data set of 61,219 Italian manufacturing firms over the period 2000–04. As a measure of lagged environmental efficiency at the firm level, the study exploits Italian environmental accounts data for $CO_2$, $NO_x$, and $SO_x$ over 1990–99. It tests the extent to which (past) environmental efficiency/intensity—which is driven by structural features and firm strategic actions, including responses to policies—influences firms' growth.

The results show, first, a typical trade-off for the three core environmental emissions analyzed: lower environmental efficiency in the recent past allows higher degrees of freedom to firms and relax the constraints for growth, at least in the short-/medium-term scenario. Nevertheless, the size of the effect is not large. Trade-offs are significant for two emission indicators out of three but negligible in terms of impacts, except for $CO_2$. For example, growth is reduced by far less than 0.1 percent in association with a 1 percent increase of environmental efficiency. Environmental efficiency does not, therefore, seem a primary cost factor and constraint to growth when compared to other factors affecting firms. In addition, nonlinearity seems to characterize the growth-environmental performance relationship. Signals of inverted U-shapes appear, suggesting that both firm strategies and recent policy efforts affect the relationship between environmental efficiency and economic productivity, turning it from a trade-off to possible joint complementarity where bad environmental performances hamper firm growth and investments in greener technologies may be associated to positive economic performances of firms and sectors.

The Department of Economics, University of Roma III, prepared a paper presenting detailed empirical analyses using the 2005 Italian Regional Air Emissions Account

[49] The assumption is that foreign companies use the same technology as domestic companies to produce goods that are imported into the domestic economy. The assumption is usually acceptable when imports come from technologically similar countries, but not when there are significant technological differences.

[50] The perspective from which a country is seen as a group of consumers of goods and services produced either domestically or in foreign markets.

(20 Italian regions covering 24 sectors) released in 2009.[51] It concludes that the achievement of positive environmental performance at the national level could strongly depend on differences in local capabilities of both institutions and the private sector. Environmental regulation alone is a weak instrument if the public and private sectors cannot transform regulation strengths into opportunities. The paper provides evidence of the role played by internal innovation, innovation spillovers, and regional policies in shaping the geographical distribution of air emissions.

The paper concludes that industrial air emissions of the Italian regions may well be affected by differences in sector-specific features such as labor productivity, innovation efforts, and region-specific regulatory frameworks. The current and future design of industrial, innovation, and environmental policies at the national and regional levels should therefore be more coordinated, while also accounting for geographical and sectoral features as well as the intrinsic nature of the environmental issue considered.

A case study by the Department of Economics, University of Torino, applied in the Piemonte region of Italy shows that hybrid air emissions accounts at the regional and subregional levels are feasible and reliable. The study shows (1) how the results of environmental modeling can be connected to economic data in an analytical framework that can be used by local planners and policy makers; (2) how important geographic information systems are for modeling purposes and for economy-environment integration; and (3) how application at local levels provide feasible and useful applications for some environmental accounts.

Using data from the European air emissions accounts, the IMT Lucca Institute for Advanced Studies prepared a paper investigating the patterns of air emission efficiency (value added per unit of emission) growth of 23 manufacturing sectors in 12 European countries with a focus on five air pollutants ($CO_2$, $NO_x$, NMVOC[52], $SO_x$, and CO). International diffusion of more efficient environmental technologies, distance from the technological frontier, energy prices, and economic productivity patterns are found to be important drivers of emission efficiency growth in manufacturing sectors. The results highlight the importance of the diffusion of more environmentally efficient production technologies from leader countries to laggards. Energy prices are found only to weakly induce improvements in emission efficiency, with the effect being generally stronger for sectors and countries farther away from the emission efficiency frontier. Total factor productivity (TFP) is strongly correlated with emission efficiency, while the distance from TFP frontier significantly harms emission efficiency growth.

Based on the results in the paper, the authors note that further research is needed to investigate the way in which sectors in laggard countries take advantage of emission

[51] Note that there is not at this time a plan to repeat this release.
[52] NMVOC: nonmethane volatile organic carbon compound.

efficiency improvements occurring in the frontier countries. The diffusion of environmental technologies leading to improvement in emission efficiency may be triggered by a variety of factors. The assessment of the contribution to the diffusion of environmental technologies of these factors is crucial to identifying the optimal policy mix.

### *Italy, Account 4 – Environmental Taxes Account*

A detailed report on the state of the environment in Italy prepared by the Italian Ministry of the Environment contains several tables related to environmental taxes that are derived using data from Istat's Environmental Taxes Account. The report notes that the ratio of environmental taxes to total fiscal revenue has diminished between 1990 and 2007 from 8.65 percent to 6.2 percent and that the ratio of environmental taxes to GDP has diminished from 3.10 percent to 2.66 percent.

In one of its regular "Statistics in Focus" short studies, Eurostat highlights data from the Italian Environmental Taxes Account in a discussion of environmental protection expenditures:

- Current expenditures accounted for 70–80 percent of environmental protection expenditures in all three sectors; capital investments accounted for the remainder.
- Environmental protection investments accounted for 2.7 percent of EU-27 gross capital formation in 2009.
- Waste and wastewater management services accounted for most of the EPE in the EU-27 in 2009.
- Public sector spending for environmental protection accounted for 1.35 percent of total public expenditure in the EU-27 in 2009.
- Environmental protection investments of specialized producers remained almost unchanged from 2002 to 2009.
- EPE accounted for 2.7 percent of gross value added in the industrial sector.

# Mexico

Mexico's environmental accounts are produced by INEGI, the National Institute of Statistics and Geography.

At the moment, six staff members are involved in the annual update of the environmental accounts, working on the application of the SEEA Central Framework, SEEA Water, SEEA Forestry, and SEEA Fisheries as well as the recommendations for the development of an Economy-wide Material Flow Account and an Environmental Protection Expenditures Account.

All of the accounts are produced annually and all are compiled at the national level only.

The main users and uses of Mexico's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 7.

## Summary of Environmental Accounts Compiled, *Mexico*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. It includes the criteria gasses. | Click here |
| **Account 2** | Water Emissions Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. It includes the discharges of untreated wastewater. | Click here |
| **Account 3** | Groundwater Depletion Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. | Click here |
| **Account 4** | Material Flow Account | Annual | National | All sectors | 2008 | 2011 | n/a | | Click here |
| **Account 5** | Waste Emission Account | Annual | National | Household sector | 1985 | 2011 | n/a | | Click here |
| **Account 6** | Environmental Protection Expenditure Account | Annual | National | Government sector | 1985 | 2011 | n/a | The start and end years are the period of study. It includes the expenses incurred by the federal government, public companies, and state and municipal governments. | Click here |
| **Account 7** | Oil and Gas Depletion Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. | Click here |
| **Account 8** | Timber Resource Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. | Click here |
| **Account 9** | Land Cover/Use Account | Annual | National | All sectors | 1985 | 2011 | n/a | The start and end years are the period of study. | Click here |
| **Account 10** | System of Environmental Economic Account for Water | Annual | National | All sectors | 2006 | 2011 | n/a | The start and end years are the period of study. It includes supply and use tables in physical units and hybrid. | Click here |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Account 11** | System of Environmental Economic Account for Forestry | Annual | National | All sectors | 2003 | 2011 | n/a | The start and end years are the period of study. | Click here |
| **Account 12** | System of Environmental Economic Account for Fisheries | Annual | National | All sectors | 2003 | 2011 | n/a | The start and end years are the period of study. | Click here |

Note: n/a = not available

## Highlights of Users and Uses – *Mexico*

### *Mexico, All Accounts*

Among all the countries surveyed for this report, Mexico is the one in which environmental accounts are most deeply integrated into national legislation and development policy. It is clear from this that environmental accounting is highly relevant to policy making in Mexico. The wise management of natural capital, which is a central measurement focus of the environmental accounts, is seen as essential to the long-term success of Mexican economic development.

Two central laws, the Climate Change Act and the Ecological Balance and Environmental Protection Act, make direct reference to the calculation of an ecologically adjusted net domestic product, a central output of the Mexican system of environmental accounts.

From the Ecological Balance and Environmental Protection Act:[53]

> *The Federal Executive shall, for the purpose of formulating and carrying out environmental policy and issuing official Mexican standards and other instruments, ensure that an ecological net domestic product is calculated by the National Institute of Statistics and Geography through the quantification of the cost of environmental pollution and the depletion of natural resources caused by economic activities.*

From the Climate Change Act:[54]

> *The National Institute of Ecology and Climate Change shall assist the Environment and Natural Resource Secretariat in quantifying the cost of environmental pollution and depletion of natural resources caused by economic activities in order to calculate an ecologically adjusted net domestic product.*

Both the overall national development plan for 2013–18 and the related environment and natural resource development plan quote the value of ecologically adjusted net domestic product as evidence of the need for strong environmental policy.

[53] Article 15, Section XIX. Free translation from the original Spanish.
[54] Article 22, Section XV. Free translation from the original Spanish.

From the national development plan for 2013–18:[55]

> *Today, there is recognition by society that the conservation of natural capital and ecological goods and services are key to national development and the welfare of the population.*
>
> *Mexico's economic growth is closely linked to the emission of greenhouse gases, excessive solid waste and air pollutants, sewage and loss of forests. The economic cost of depletion and environmental degradation in Mexico in 2011 represented 6.9% of GDP, according to the National Institute of Statistics and Geography.*

From the national development plan for environment and natural resources for 2013–18:[56]

> *Over the last century, Mexico's population grew from just over 15 to about 114 million people. Use of the environment and natural resources was aimed at meeting short-term needs and obtaining the greatest economic benefit. This has resulted in significant deterioration of Mexico's natural capital.*
>
> *This use of natural resources and ecosystems, however, did not translate into sustained economic growth and well-being for the majority of the population. Economic growth has slowed to about 2% on average in the past three decades. In 2012, about 45% of the population lived in poverty. This number was higher in rural areas (61.6%) and among the indigenous population (72.3%), both of whom depend heavily on the use of natural resources.*
>
> *In this context, the challenge facing Mexico is to establish and follow a development model that achieves sustained economic growth without jeopardizing the natural resource base for future generations. "Greening" the path of national growth and development and recognizing the value of natural capital will be essential for progress towards sustainable development.*
>
> *Up to now, Mexican growth has been far from environmentally sustainable. Parallel to the increase in GDP, Mexico also increased the emissions of carbon dioxide, the generation of different types of wastes and the loss of forests. This loss and degradation of natural capital is accompanied by significant economic costs. According to estimates from the National Institute of Statistics and Geography, the total cost of depletion and environmental degradation represented 6.5% of GDP in 2011.*

[55] Page 77. Free translation from the original Spanish.
[56] Page 21. Free translation from the original Spanish.

## Netherlands

The Netherlands' environmental accounts are produced by the Central Bureau of Statistics, the national statistical office of the Netherlands.

At the moment, approximately 2.5 full-time-equivalent staff members are employed in compiling and reporting the environmental accounts. These employees are involved in production activities only; those working on research activities are not counted.

The frequency of compilation varies according to the account, with most being compiled on an annual basis. The Netherlands is one of only three countries to produce environmental accounts on a quarterly basis (the Greenhouse Gas Emissions Account).[57]

For the most part, the Netherlands' environmental accounts are compiled at the national level only. The exceptions are the Water Use and Water Emissions Accounts and the Land Cover Account, which also include data at the subnational level for ecological units in the case of water and political units in the case of the land cover unit.

In all relevant cases, the accounts cover all sectors of the economy.

The main users and uses of the Netherland's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 8.

[57] The other countries are Australia, which also estimates greenhouse gas emissions on a quarterly basis, and Canada, which plans to begin estimating national wealth on a quarterly basis beginning in the fall of 2014.

## Summary of Environmental Accounts Compiled, *Netherlands*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs (FTE) | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1990 | 2011 | 0.25 | | Click here |
| **Account 2** | Water Emissions Account | Biennial | National and subnational (ecological boundaries) | All sectors | 1995 | 2010 | 0.15 | | Click here |
| **Account 3** | Water Use Account | Annual | National and subnational (ecological boundaries) | All sectors | 2003 | 2010 | 0.1 | A project is ongoing to extend the time series. | Click here |
| **Account 4** | Energy Use Account | Annual | National | All sectors | 1995 | 2011 | 0.1 | | Click here |
| **Account 5** | Economy-wide Material Flow Account | Annual | National | All sectors | 1996 | 2011 | 0.25 | Full physical supply use tables have been produced for one year only (2008). Staff costs exclude the cost of the 2008 physical supply and use tables. | Click here |
| **Account 6** | Waste Emission Account | Biennial | National | All sectors | 2003 | 2010 | 0.15 | | Click here |
| **Account 7** | Environmental Subsidies Account | Annual | National | | 2005 | 2010 | 0.2 | This account is experimental. The focus is on measuring aggregate subsidies. The allocation of subsidies by industry has been done for one year only. | Click here |
| **Account 8** | Environmental Taxes Account | Annual | National | All sectors | 1990 | 2011 | 0.15 | | Click here |
| **Account 9** | Environmental Protection Expenditure Account | Annual | National | All sectors | 1990 | 2009 | 0.5 | Some data are biennial. | Click here |
| **Account 10** | Environmental Goods and Services Account | Annual | National | All sectors | 1995 | 2010 | 0.35 | Staff costs exclude work on the sustainable energy sector. | Click here |
| **Account 11** | Energy Resource Account | Annual | National | All sectors | 1990 | 2011 | 0.15 | Physical and monetary asset | Click |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | accounts | here |
| **Account 12** | Land Cover Account | Triennial | National and subnational (political boundaries) | | 1996 | 2010 | n/a | | Click here |
| **Account 13** | Account for Emission Permits | Biennial | National | All sectors | 2003 | 2011 | 0.2 | | Click here |
| **Account 14** | Quarterly $CO_2$ Emissions Account | Quarterly | National | All sectors | 2010 | 2013 | 0.1 | | Click here |

Note: n/a = not available; FTE = full-time equivalent

## Highlights of Users and Uses – *Netherlands*

### *Netherlands, Account 2 – Water Emissions Account*

The Netherlands Central Bureau of Statistics used data from the Water Emissions Account in a study of the economic value of activities related to the Dutch Continental Shelf (DCS) for the years 1995, 2000, and 2007. Activities such as shipping, oil and gas production, and wind energy production were included in the study. Also included were economic activities in ports and in the coastal zone of the North Sea. The motivation for this study was the European Marine Strategy Directive, which requires social and economic analysis of the use of the marine environment. The following industries were studied: oil and gas extraction, fisheries, shipping, sand extraction, and (beginning in 2006) wind power.

The study covered activities of all Dutch companies in the DCS. Data on the value of production, intermediate consumption, and value added were presented. In addition, the number of jobs and value of employee compensation were measured. Measured in terms of production and value added, oil and gas extraction was by far the most important activity on the DCS.

### *Netherlands, Account 5 – Economy-wide Material Flow Account*

This report[58] was prepared by the Central Bureau of Statistics at the request of the Dutch Ministry of Economic Affairs. It studied physical material flows related to the Dutch economy in 2008 in order to assist the ministry with the evaluation of Dutch commodity policies. The study made use of the Dutch Economy-wide Material Flow Account, noting that data for some industries and materials were not available and, therefore, only aggregate-level results were possible.

A follow-up study for 2010 is to be released in 2014, at which point it will be possible to determine if Dutch material-use policies have had an impact on material flows.

### *Netherlands, Account 7 – Environmental Subsidies Account*

In the Netherlands, various subsidies are provided to companies and research institutions to promote environmental innovations. In this study, the Netherlands Central Bureau of Statistics analyzed environmental innovation schemes promoted by Agentschap Netherlands[59] and their impact on the development of companies in the Dutch environmental technology sector. Only companies that used the schemes

[58] This text is a free translation from the original Dutch.

[59] Agentschap Netherlands is a division of the Dutch Ministry of Economic Affairs that carries out policy and subsidy programs focusing on sustainability, innovation, international business, and cooperation.

during the period 2004–06 were the subjects of analysis. Data from the Environmental Subsidies Account were used in the study.

The effectiveness of grants was measured on the basis of employment growth in the analyzed companies. The study showed that companies with multiyear grants grew faster than those without subsidies, though causality was not established. However, further research has shown that, if corrected for characteristics in the two groups, there is a statistically significant difference in employment growth between companies receiving subsidies and those not.

Notable were the large standard deviations for growth in employment in both groups, meaning that the performance of companies varied widely within each particular group. Only some companies that received subsidies grew significantly; some even shrank. The same applied to companies in the group that received no subsidies.

### *Netherlands, Account 10 – Environmental Goods and Services Account*

At the request of the Dutch Ministry of Economic Affairs, the Central Bureau of Statistics undertook an "economic radar" study of the sustainable energy sector in the Netherlands. Data from the Environmental Goods and Services Account were used in the study, which showed a gradual increase of the importance of the sector from 2008 to 2010:

- Employment growth of the sustainable energy sector, measured in FULL-TIME EQUIVALENT's, in 2009 and 2010 was about 4 percent. In contrast, employment of the total Dutch economy decreased in the period 2008–10.
- The contribution of sustainable energy sector to GDP grew to 0.31 percent in 2009.
- While production decreased between 2008 and 2009, both employment and value added grew in the same period.
- The growth in value added is solely the result of more value added in sustainable energy production.
- Activities related to "energy saving," "solar energy," and "bio energy" played the biggest role in the sustainable energy sector.
- Growth in goods exports has led to an improvement of the trade balance of the sustainable energy sector.
- Sustainable energy companies in the preproduction phase are, generally speaking, relatively more innovative than Dutch economy as a whole.

There are plans to repeat the study with more recent economic data and additional data on foreign investments and capital depreciation in the sustainable energy sector. Population dynamics will be investigated in next study as well.

## Norway

Norway's environmental accounts are produced by Statistics Norway, the national statistical office. They are summarized in the table below.

It is worth noting that Statistics Norway was one of the earliest agencies to begin work on environmental accounting. It's earliest efforts date back to the 1970s.[60]

All accounts in Norway are compiled on an annual basis, which is unique among the countries reviewed for this study. In all other countries, at least some accounts are compiled less frequently than annually.

Norway's environmental accounts are compiled either for the country as a whole or subnationally using political boundaries. No accounts in Norway are compiled using ecological boundaries.

In all relevant cases, the accounts cover all sectors of the economy.

The main users and uses of Norway's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 9.

[60] K. H. Alfsen, T. Bye, and L. Lorentsen, "Natural Resource Accounting and Analysis: The Norwegian Experience 1978–1986," *Social and Economic Studies* 65 (1987), Statistics Norway, Oslo, http://www.ssb.no/a/histstat/sos/sos_065.pdf.

## Summary of Environmental Accounts Compiled, *Norway*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account/Air Emission Inventory | Annual | National | All sectors | 1980 | 2012 | n/a | | Click here |
| **Account 2** | Water Emissions Account | Annual | Subnational (political boundaries) | All sectors | 1999 | 2012 | n/a | | Click here<br><br>Click here |
| **Account 3** | Water Use Account | Annual | National and subnational (political boundaries) | All sectors | 1999 | 2012 | n/a | | Click here |
| **Account 4** | Energy Use Account | Annual | National | All sectors | 1990 | 2012 | n/a | | Click here |
| **Account 5** | Economy-wide Material Flow Account | Annual | National | All sectors | 1995 | 2011 | n/a | | Click here |
| **Account 6** | Waste Emission Account | Annual | National and subnational (political boundaries) | All sectors | 1995 | 2011 | n/a | | Click here<br><br>Click here |
| **Account 7** | Environmental Subsidies Account | | | | | | n/a | An experimental account with no regular compilation of data. Some pilot studies in respond to demand from the European Union. Statistics Norway participates in EU task force groups on the development of this statistic. | Click here |
| **Account 8** | Environmental Taxes Account | Annual | National | All sectors | 2008 | 2011 | n/a | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Account 9** | Environmental Protection Expenditure Account | Annual | National | All sectors | | | n/a | An experimental account with no regular compilation of data. Data for some sectors is collected and published in the environmental expenditure statistics. | |
| **Account 10** | Environmental Goods and Services Account | Annual | National | All sectors | | | n/a | An experimental account with no regular compilation of data. | |
| **Account 11** | Energy Resource Account | | | | | | n/a | The Energy Resource Account in physical units is maintained by the Norwegian Petroleum Directorate.<br><br>The calculation of the monetary value of energy resource stocks is carried out by Statistics Norway for the purpose of compiling the indicator of national wealth. | Click here<br><br>Click here |
| **Account 12** | Timber Resource Account | Annual | Subnational (political boundaries) | All sectors | 2005 | 2011 | n/a | | Click here |
| **Account 13** | Marine Resources Statistics | Annual | National and subnational (political boundaries) | All sectors | 2000 | 2012 | n/a | | Click here |
| **Account 14** | Land Cover/Use Account | Annual | National and subnational (political boundaries) | All sectors | 2005 | 2011 | n/a | | Click here |
| **Account 15** | Non-Timber Forest Resource Account | Annual | National and subnational (political boundaries) | All sectors | 1986 | 2011 | n/a | A number of statistics on hunting are available. | Click here |

Note: n/a = not available

# Highlights of Users and Uses – *Norway*

### *Norway, Various accounts*

The environmental accounts are a main input into Statistics Norway's preparation of Norway's sustainable development indicators. The main findings in 2012 for the indicators linked to the environmental accounts and related statistics include the following:

- The energy intensity of the economy is decreasing, but the total energy use is still increasing. The percentage renewable energy is not significantly higher today than it was 30 years ago.
- Several important fish stocks in Norwegian waters are currently at healthy levels and are being harvested sustainably. The size of the spawning stock of Northeast Arctic cod is now at the highest level seen during the entire time series dating back to 1946.
- Between 1976 and 2011, a total of 562 square kilometers of cultivated and cultivable land have been irreversibly converted to nonagricultural.
- Norwegian greenhouse gas emissions decreased in 2011, but were higher than in 1990 and above the Norwegian Kyoto target. In 2011, Norway's emissions of $NO_X$ were reduced, but were still significantly above the target set in the Gothenburg Protocol. However, the emissions of other acidifying gases and of NMVOCs were below the Gothenburg Protocol targets.
- The emissions of hazardous substances increased significantly from 2009 to 2010.
- The *Nature Index* for Norway shows that the state of biodiversity in the open sea, coastal waters, fresh water, and mountains is generally good. Wetlands are in an acceptable condition, while open lowland (including old cultural landscapes) and forest have the lowest index values. The main threat to biodiversity is habitat loss and changes.

### *Norway, Account 8 – Environmental Taxes Account*

The Statistics Norway Research Department prepared a report that discusses the separate identification of environmental taxes from other taxes in light of tax theory and presents a theoretically consistent set of guidelines for the calculation of environmental taxes. To study the measurement problem empirically, they compare environmental taxes based on the theoretical definition with those based on internationally defined guidelines for reporting environmental taxes as defined by Eurostat.[61] They find that the international guidelines include taxes far beyond environmental considerations and that there is a lack of theoretical foundation for

[61] Eurostat, *Environmental Taxes: A Statistical Guide* (Luxembourg: Office for Official Publications of the European Communities, 2001).

the international guidelines that leads to interpretation problems. They argue that steps should be taken to harmonize the international guidelines for the calculation of environmental taxes with economic theory.

The optimal environmental tax, the Pigouvian tax, equals the marginal damage cost. They argue that when tax rates on externalities are set higher than marginal damage costs, the difference should be subtracted from the tax.

The Eurostat definition includes taxes related to environment, energy ,and transport together and hence aggregates fiscal taxes and environmental taxes in a common measure. Even though the Eurostat guidelines use the term "environmentally *related* taxes," the term "environmental taxes" is used in reports of the international statistics. This can lead to misunderstandings on the part of the users of the data.

The researchers note that even with a stringent definition based on theory, subjective judgments are hard to avoid when separating environmental taxes from other taxes. Even with a wide confidence interval, comparisons of environmental tax revenues following the theoretical definition suggests that the Eurostat definition is too broad to reveal the variation in environmental taxes. Consequently, scientists using the data may draw misleading conclusions on the causes and effects of environmental policy and the public is presented with faulty information on the ranking of environmentally friendly policies over time and across countries. To improve the statistical framework of the reports on environmental taxes, the international guidelines should be revised based on economic theory.

### *Norway, Account 11 – Energy Resource Account*

The Division for Energy and Environmental Statistics of Statistics Norway prepared a report[62] on trends in Norwegian national wealth from 1985 to 2004 that adopts an interpretation of sustainable development in which sustainability is defined as a level of consumption *per capita* in a given year should is no larger than the level that can be sustained in all subsequent years. "Consumption" is interpreted as not only the consumption of goods and services produced by economic activity, but also all other goods and services that contribute to human welfare; for example, access to unspoiled nature, clean water, clean air, and so on. The sustainability of consumption, the study notes, is particularly relevant in relation to the use of nonrenewable natural resources such as oil and gas and irreversible degradation of the natural environment by overfishing, loss of biodiversity, and anthropogenic climate change.

In the national accounts, the aggregate net national income (NNI) provides a measure of how much income is available for consumption and how much must be is saved in each year in order to maintain wealth. NNI does not, however, consider all forms of capital, but only the use of produced capital. Thus, it does not take into

[62] The summary presented here is a free translation from the original Norwegian.

account, for example, the fact that nonrenewable natural resources must be used up sooner or later or that the overuse of renewable natural resources today means less income opportunities in the future. Trends in NNI alone are therefore not suitable to assess whether the current consumption is sustainable.

To address the inadequacy of NNI as measure of sustainable income, Statistics Norway calculates a measure of national wealth. According to theory, as long as national wealth *per capita* remains constant or increases over time there is reason to believe that development is sustainable. National wealth in Norway was calculated by adding together the value of manufactured capital, human capital, and various natural resources assets (oil, gas, minerals, fish, agriculture, timber, fishing, trapping, aquaculture, and hydropower).

The results of Statistics Norway's study show that national wealth per capita increased during the period from 1985 to 2004 with the exception of 1988, 1989, and 1990. In those years, the value of human capital and produced capital fell due to rising unemployment and lack of investment. Given the generally rising trend in per capita national wealth, Statistics Norway notes that it is difficult to say that Norwegian development was not sustainable in the period 1985 to 2004. This conclusion, however, is noted to be based on only a partial assessment of Norway's capital. Many important environmental assets, such as biodiversity and a stable climate, are omitted because of the difficulty of giving these an economic value.

The Energy Resource Account is also used by the Division for Energy and Environmental Statistics of Statistics Norway in the compilation of the "national wealth" indicators within the Norwegian federal sustainable development strategy.[63] Natural resource assets, including energy assets, make up about 12 percent of Norway's national wealth. The majority of national wealth, about 76 percent, is made up of human capital.

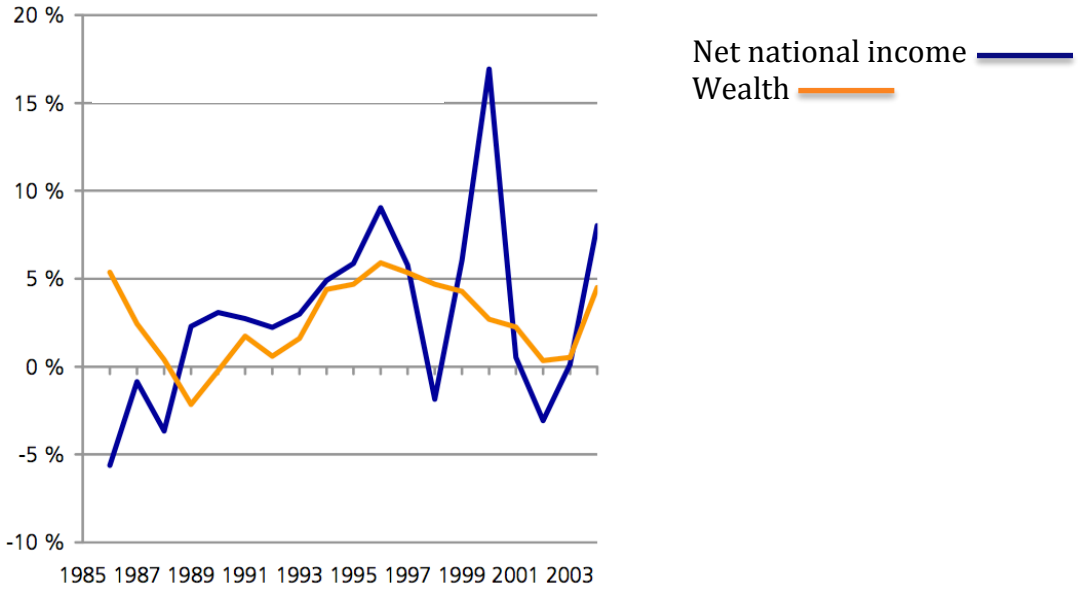
The Statistics Norway Research Department studied[64] the question of the sustainability of the Norwegian economy using, among others, data from the Energy Resource Account. In their calculations, the agriculture and fishing and hunting industries showed a negative resource. It could be concluded, therefore, that Norwegian national wealth would increase if these industries did not exist. However, the researchers concluded that both agriculture and fishing and hunting have in reality higher resource rent than is calculated in the environmental accounts, but that this rent is "dispersed" through policies that aim at regional economic development. Both the agriculture and fishing and hunting industries are significant outside of the main population centers of Norway. Statistics on resource rents can, therefore, be criticized for mixing the generation of income on one hand and the use of income on the other. As a result, both agriculture and fishing and hunting appear to be less important in Norway than they are in reality.

[63] The summary presented here is a free translation from the original Norwegian.
[64] The summary presented here is a free translation from the original Norwegian.

The authors note that there is a widespread perception that Norway is a rich country because Norway has great natural resources. This is not entirely true, they note. Though Norway's oil and gas reserves represented 12 percent of national wealth in 2004, human capital constituted fully 76 percent (as noted in the summary above from the Norwegian sustainable development indicators). Produced capital represents virtually the rest.

The authors ask whether economic development in the period 1985 to 2004 was sustainable in Norway. To consider this, they plotted the changes in national wealth and net national income together (see figure 19).

**Figure 19. Percentage Change in Norwegian National Wealth and Net National Income, 1985–2004**




As can be seen, national wealth fell between 1988 and 1990 but was increasing in all other years. Since sustainable development is a long-term issue and the reduction in national wealth in the years 1988 to 1990 was small and insignificant in relation to its subsequent growth, the authors conclude that it is difficult to say that the Norwegian economic development was not sustainable in the study period.

### *Norway, Account 14 – Land Use/Cover Account*

In a study prepared as part of Norway's "Cities of the Future Program"[65] by the Division for Natural Resources and Environmental Statistics of Statistics Norway some of the greatest challenges to reconciling urban development with environmental issues are noted to be found in cities. The Norwegian government's environmental policy has given focus to the importance of the urban environment.

[65] The "Cities of the Future" program started in 2008 and is based on an agreement between the cities, the private sector, and the state, led by the Ministry of the Environment.

The report contains selected indicators and statistics describing the state of the urban environment in 13 of the largest urban areas of Norway.

The “Cities of the Future” had close to 1.8 million inhabitants as of January 1, 2012, which is equivalent to more than a third of the population in Norway. In 2011, the population growth in these municipalities was about 46 percent of the total population growth.

Excessive urban density can come at the expense of access to playgrounds, recreational areas, and other green space. In 2011, there was less access to these areas in the “Cities of the Future” compared to all urban settlements in Norway.

Another focus of the study was on the degree to which inhabitants chose to use environmentally friendly transportation instead of cars. Environmentally friendly transportation showed only slight growth in the period 2001–09, even though the length of walking paths and cycle paths increased. The number of cars as well as the distance driven in cars both increased during the period.

All of the “Cities of the Future” exceeded the limit for concentrations of particulate matter in air in 2011. For $NO_2$, only one city did not exceed the permitted limit in the same year.

## Sweden

Sweden's environmental accounts are produced by Statistics Sweden, the national statistical office. They are summarized in the table below.

The accounts in Sweden are compiled mainly on an annual basis, though the water and waste accounts are published less frequently. The accounts are mainly compiled for the country as a whole, but subnationally, accounts using both political and ecological boundaries are also published.

Most of the accounts (where relevant) cover all sectors of the economy. The exceptions are the waste account, environmental protection account and chemical use accounts, which are published for the business sector only.

The main users and uses of Sweden's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 10.

## Summary of Environmental Accounts Compiled, *Sweden*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs[66] | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1993 | 2010 | n/a | $CH_4$, $CO_2$, CO, $SO_2$, $NO_x$, $N_2O$, $PM_{10}$, $PM_{2.5}$, $NH_3$ | Click here |
| **Account 2** | Water Emissions Account | Occasional | National and subnational (ecological boundaries) | All sectors | 1995 | 2010 | n/a | Water districts for selected industries, N, P, COD, BOD | Click here |
| **Account 3** | Water Use Account | Quinquennial | National and subnational (ecological boundaries) | All sectors | 1995 | 2010 | n/a | Water use by industry, households | Click here |
| **Account 4** | Energy Use Account | Annual | National | All sectors | 1993 | 2010 | n/a | About 11 different energy sources | Click here |
| **Account 5** | Economy-wide Material Flow Account | Annual | National | n/a | 2000 | 2010 | n/a | Published by material, not industries | Click here |
| **Account 6** | Waste Emissions Account | Occasional | National | Business sector | 1993 | 2002 | n/a | Swedish EPA currently publishes annual waste statistics by industry. | Click here |
| **Account 7** | Environmental Subsidies Account | Annual | National | All sectors | 2000 | 2012 | n/a | National total, industry breakdown as pilot | Click here |
| **Account 8** | Environmental Taxes Account | Annual | National and subnational (ecological boundaries) | All sectors | 1993 | 2011 | n/a | National total and industry breakdown on selected taxes, water districts | Click here |
| **Account 9** | Environmental Protection Expenditures Account | Annual | National and subnational (ecological boundaries) | Business sector | 1997 | 2011 | n/a | Only industry (NACE C-E), only investments and current expenditures | Click here |

[66] A breakdown of costs by account is not available. The total yearly cost of production is 6.5 million Swedish kronor (about US$1 million).

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Account 10** | Environmental Goods and Services Account | Annual | National and subnational (political boundaries) | All sectors | 2003 | 2011 | n/a | Turnover, exports, employed by gender | Click here |
| **Account 11** | Chemical Use by Industry | Annual | National | Business sector | 1997 | 2010 | n/a | | Click here |
| **Account 12** | Environmentally Extended Input-output Analysis | Annual | National | All sectors | 1993 | 2010 | n/a | Published material until 2008, new data until 2010 expected in autumn 2013 | Click here |

Note: n/a = not available

# Highlights of Users and Uses – *Sweden*

### *Sweden, Account 1 – Air Emissions Account*

A report on the climate change impact of Swedish consumption by the Swedish Environmental Protection Agency analyzed the quantity of greenhouse gas emissions caused by Swedish consumption regardless of where in the world the production needed to supply the consumption occurs. The study included emissions of carbon dioxide, methane, and nitrous oxide. The analysis was principally done using data from the Air Emissions Accounts of Sweden and other countries. The report does not analyze policy instruments or the costs of measures that are discussed to reduce greenhouse gas emissions.

Analyzing emissions from the consumption perspective means that emissions that take place in all stages of production *from cradle to grave* are allocated to the final consumers of goods and services. Emissions that are caused by Swedish exports are therefore deducted from emissions that take place in Sweden and emissions that are generated by imports from other countries are added in order to estimate emissions from Swedish consumption.

Greenhouse gas emissions in Sweden, including from international transport, totalled around 76 million metric tons of carbon dioxide equivalents (megatons $CO2_e$) in 2003. From a consumption perspective, emissions of around 24 megatons $CO2_e$ caused by the production of exports are allocated to other countries.

Manufacturing and transportation of imports to Sweden are estimated, partly on the basis of the environmental accounts in other countries, to lead to emissions on the order of 43 megatons $CO2_e$. Swedish consumption in 2003, therefore, caused greenhouse gas emissions on the order of 95 megatons $CO2_e$. In comparison with the emissions that actually take place in Sweden, emissions from the consumption perspective are at least 25 percent higher.

Measured in terms of the population of Sweden, emissions from a consumption perspective are equivalent to just over 10 metric tons $CO2_e$ per capita. Just over 80 percent of emissions are caused by private consumption and just under 20 percent by public consumption. Private consumption in the report is divided into the activities of *eating,* with just over 25 percent of emissions; *housing,* with just over 30 percent; *travel,* with just under 30 percent; and the residual item of *shopping,* with just under 15 percent, with purchasing of clothes and shoes being the largest sub-item.

The following household activities together account for around half of greenhouse gas emissions and are therefore significant if Sweden is to reduce emissions:

- Private transportation (road and air)
- Home heating
- Other home energy use
- Eating habits

In a similar study also carried out by the Swedish Environmental Protection Agency, reference is made to the "generational goal" that sets the direction for Sweden's environmental policy. This policy, which was reformulated and agreed to by the Swedish Government in 2010, reads:

> *The overall goal of Swedish environmental policy is to hand over to the next generation a society in which the major environmental problems in Sweden have been solved, without increasing environmental and health problems outside Sweden's borders.*

The goal requires that environmental policy in Sweden not lead to increased environmental and health problems outside of Sweden. This requires that Sweden's environmental impact in other countries from, among other things, importing foreign goods and services be measured.

The purpose of this study was to develop indicators for emissions of greenhouse gases and other emissions to air caused by Swedish consumption in order to measure the negative environmental impact of the Swedish in other countries. The indicators are generally intended to track emissions over time and not to look into exact emission levels.

The results of the study, which used methodology similar to the one described above, show that total greenhouse gas emissions caused by Swedish consumption grew from 90 megatons $CO2_e$ in 2000 to 98 megatons in 2008, an increase of 9 percent. All of this increase was due to increased emissions associated with imports. Emissions associated with consumption of domestically produced goods and services actually declined during the period. About half of the increase can be explained by population growth during the time period. The rest is due to increased and/or changing patterns of import consumption.

In preparation for the 2012 UN Conference on Sustainable Development, the Swedish Confederation for Professional Employees (TCO) examined how sustainably the world's countries have been developing since 1972, the year the first UN environmental conference was held in Stockholm.

Overall, the study found that the world's carbon intensity has decreased by 43 percent since 1972.

However, the world economy has grown many fold during the same period and global emissions continue to increase as a result. Luxembourg and Sweden are the most successful of all countries, with carbon-intensity reductions of over 80 percent,

and 70 percent, respectively. Some 40 countries were found to have reduced their emissions.

### *Sweden, Accounts 2, 3, 8 and 9 – Water Use, Water Emissions, Environmental Protection Expenditure and Environmental Taxes Accounts*

This report prepared by Statistics Sweden for the Swedish water board authorities contains statistics on Sweden's five major river basins—Bottenviken (Bothnia Bay), Bottenhavet (Bothnia Sea), Norra Ostersjon (Northern Baltic), Sodra Ostersjon (Southern Baltic) and Vasterhavet (Skagerack-Kattegat)—and covers the period from 1995 to 2005.

The statistics include economic variables (value added, turnover, environmental taxes, and environmental protection expenditure), labor (employment and workplaces), water abstraction, use of water, and emissions. Statistics on population, number of families, and income have also been produced.

The statistics are presented in tables and figures (as environmental economic profiles and as indexed times series) for each river basin district by industry according to the Swedish nomenclature for industry classification. Activities that are heavy water users are presented in more detail.

The report is intended to complement scientific research within the water basins. It aims to provide a base for establishing measures and targets for Swedish water authorities.

The report found that from 1995 to 2005 Swedish GDP increased by 32 percent, while water abstraction during the same time fell by 2 percent and employment increased by 9 percent. It can be said, therefore, that there has been decoupling of the connection between the economy and water use in Sweden during the period.

The river basin of Skagerack-Kattegat saw the largest share of water abstraction. On the other hand, the enterprises contributing the most to the gross regional product are located in the river basin district of the Northern Baltic. This area includes Malardalen in the Greater Stockholm area. The river basin district of the Northern Baltic also has the largest percentage of employed people, the highest income levels for households, and the largest share of the Swedish population.

The Bothnia Sea had the largest percentage of emissions of phosphorous (30 percent) and COD (39 percent) from point sources in Sweden. This is due to the presence of pulp and paper industries. The river basin district of the Skagerack-Kattegat had the largest share of emissions of nitrogen and BOD—26 percent and 30 percent, respectively—in Sweden.

The river basin district with the lowest levels of pressure on water, both in terms of abstraction and of emissions, is the river basin district of Bothnia Bay. This river basin district covers a largely unpopulated area where few enterprises are located.

The statistics used in the report cover less than 20 percent of total Swedish emissions of phosphorous, nitrogen, COD, and BOD because they focus on large, point-source emissions only. Emissions from non-point sources like agriculture, traffic, and spills are not part of the calculations. This speaks to the need for the environmental emissions accounts to be comprehensive in terms of their sectoral coverage. The emissions also cover only a subset of all pollutants released to Swedish waters. Again, this points to the need for emissions accounts to be comprehensive in terms of pollutant coverage.

### *Sweden, Account 5 – Economy-wide Material Flow Account*

In an evaluation of Sweden's environmental objectives established in 2008, "a lack of basic knowledge ... on the occurrence of toxic substances in goods" was noted by the Swedish Environmental Objectives Council. They suggested "stepping up actions to develop ... information on toxic substances in goods."

The Swedish Commodity Guide[67] is a database that contains information on materials and chemical substances in various product groups. The Commodity Guide, developed by the Swedish Chemicals Agency, has been built up using data on average material content in goods from the Danish Environmental Protection Agency, supplemented with statistics from Statistics Sweden's Economy-wide Material Flow Account. At the moment, the Commodity Guide is an internal tool only, but there are plans for it to be posted on the Internet and be accessible to all.

Statistics Sweden carried out a project under contract to Eurostat to apply the Swedish Economy-wide Material Flow Account to show the amount of domestic production, import, and export of a selection of hazardous substances. Indicators such as domestic material consumption (import – export + domestic production) per group of hazardous substances were developed. The study also aimed to measure the use of some specific chemical products (gasoline, diesel, polyaromatic hydrocarbons, flame retardants, and alcylphenols).

Most European Union member countries now compile statistics on material flows regularly, based on Eurostat's *Compilation Guide for Economy-Wide Material Flow Accounts* (EW-MFA). These data are presented with a high level of aggregation and large volume flows can easily mask small volume flows (for example, toxic substances) that may have large impacts on environmental quality. Emissions of hazardous substances from the use of products that contain them are now the dominant source of emissions to the environment in developed countries like

[67] This summary is a free translation from the original Swedish.

Sweden.[68] This makes it important to collect more information on the use of hazardous substances in chemicals and products. This project developed a method to collect data on the inflows of hazardous substances in products.

The method involved collection of data from international trade and production data for groups of chemicals and individual chemicals. Data were presented using the combined nomenclature system (CN), which is one of the classification systems used in EW-MFA. CN is a very detailed classification system, with about 10,000 different codes.

The result shows that it is possible to calculate the DMC, or net inflow, for groups of chemicals using existing statistics. The data come from trade statistics (import and export) and production statistics. Data for domestic and foreign production seem to be available for most of the chemicals covered in the study, since they are obligatory statistics in EU legislation.

In another project carried out by Statistics Sweden, the aim was to analyze to what extent existing statistics can be used to account for flows and losses of fruits and vegetables in the food chain. The project used data methodological approaches based on the Economy-wide Material Flow Account. Fruits and vegetables were chosen on the assumption that a large share of fruits and vegetables pass through the food chain without being processed and hence they would be easy to follow; for example, a banana is imported, stored, sold, and consumed in the same form, as a whole fruit. However, fruits and vegetables are also of interest because a large share of them end up as waste.

The statistical system is primarily structured to deal with monetary values along the supply chain. Knowledge of physical flows is also interesting since it is the physical goods themselves that are being produced, transported, used, stored, and become waste in a society. However, accounting for physical goods requires that data be combined in new ways. This project worked with two methodological approaches.

The first approach combined agriculture, trade, industrial production and waste statistics. This is similar to the workflow used in MFA. With this approach, the net inflow of fruit and vegetables can be quantified but it is not possible to distinguish different products related to separate parts of the supply chain. The net inflow (that is, imports + domestic production - exports) is the amount that is used in Sweden, either for further conversion in the value chain or for final consumption. The net inflows can only be calculated for individual groups of products, or unprocessed products such as whole apples, carrots or bananas.

In the second methodological approach a modified version of the product balances of the national accounts was used for distributing fruits and vegetables per industry.

[68] P. H. Brunner, "Reshaping Urban Metabolism," *Journal of Industrial Ecology* 11, no. 2 (2007): 11-13.

The monetary breakdown of the product groups per industry was used as a basis for allocating the physical flow. Data on the net inflow were again taken from foreign trade statistics, industry, and commodity production statistics from the Board of Agriculture. Data were then summarized for the relevant product groups, such as potatoes, vegetables and fruit. There are several uncertainties associated with this procedure. However, the methodological approach demonstrates a possibility to follow and the physical flows of various industries.

In this project, bananas were chosen as a case study as the total flow is a result of imports. But bananas are also interesting because the banana is the most common fruit in Sweden. The net inflow of bananas to Sweden was about 150,000 metric tons in 2006 and the magnitude of loss is approximately 50,000 metric tons. The largest share of losses is by the consumer, followed by the losses in harvesting and trans-shipment of bananas to Sweden.

In a similar study by Statistics Sweden, the Economy-wide Material Flow Account was used as the basis to track the annual physical flows of medicines, cosmetics, and hygiene products. The goal of this study was to quantify the total amounts of active ingredients for human and veterinary medicines as well as the annual sales of some medication groups. Another goal was to report on the flow from sale to recipient of a number of active ingredients. The goal for cosmetic and hygiene products was threefold: to quantify the total sales, to divide the sales into product groups (such as shampoo), and to discuss the possibility of developing data for functional groups such as surfactants.

The method for the project was to review and compare different data sources and discuss results provided. The data source for active medicinal ingredients was the sales statistics from the Swedish Medical Product Agency. It was not possible in the scope of this project to obtain reliable data about sales of active ingredients. The conversion from defined daily dosages to kilograms was more complicated and extensive than was foreseen by the Swedish Medical Product Agency. There are also data about the domestic consumption of medicine in Statistics Sweden's statistics that, aside from active ingredients, also include component substances, such as preservatives and emulsifiers, which means that these cannot be compared to the Swedish Medical Product Agency's sales statistics regarding active ingredients. Also, the design of the code structure on which the statistics are based on is not adapted to present usage of medicines, which means that a complete picture of consumption cannot be provided based on the statistics of Statistics Sweden.

Based on the amounts of active ingredients sold, calculations were conducted for the flow from sale to recipient of the following active ingredients: hydrochlorothiazide, enalapril, metoprolol, furosemide, paracetamol, ketoprofen, naproxen, metformin, and ethinylestradiol. Results of the flow calculations show that uncertainties are large and must be reduced if the results are going to be of practical use. It was not possible to address these uncertainties within the scope of this project.

The best data source for ascertaining the total sales of cosmetic and hygiene products has been the sales statistics provided by the Swedish Cosmetic, Toiletry & Detergent Association, which in turn are provided for by their member companies. Statistics Sweden can prove a good data source regarding domestic consumption for some product groups. The design of the code structure is not adapted to present usage as regards cosmetic and hygiene products, which means that a complete picture of consumption cannot be provided even using statistics from Statistics Sweden.

The total amount of cosmetic and hygiene products sold in Sweden in 2006 was more than 40,000 metric tons according to the Swedish Cosmetic, Toiletry & Detergent Association's sales statistics. Total sales have increased by nearly 10 percent since 2000. The largest groups are liquid soaps, shampoo, and body care products. There are corresponding statistics on domestic consumption for five product groups in Statistics Sweden's data: perfumes, shampoo, permanent lotions, toothpaste, and deodorants. These product groups totaled 13,000 metric tons consumed in 2005, which accounts for over 30 percent of the total sales according to the Swedish Cosmetic, Toiletry & Detergent Association's sales statistics. There are 16,000 metric tons of these products consumed in one year according to Statistics Sweden's statistics. It was not possible to ascertain more reliable statistics about the component functional groups or individual substances in cosmetics and hygiene products.

### *Sweden, Account 7 – Environmental Subsidies Account*

A report by the Swedish Environmental Objectives Council[69] was carried out to provide a basis for evaluating the efforts to achieve Sweden's 16 environmental quality objectives.[70] The aim of the project was to supplement existing environmental indicators to include environment-economy variables that can be linked to the state budget. This may help increase understanding of the budget's impact on environmental efforts and clarify the significance of environmental-economic instruments.

The following variables were examined to evaluate the importance of state environmental expenditures: changes to the expenditures over the 1995–2006 period; total expenditure to industries that have higher-than-average emission intensities; expenditures that go to activities with a potentially negative impact on the environment; and total expenditure to Swedish industry for environmental protection measures. A comparison was also made of government spending on environmental protection in EU member states.

[69] The Swedish Environmental Objectives Council promotes consultation and cooperation in implementing the environmental quality objectives adopted by the Parliament. The council consists primarily of representatives of central government agencies and county administrative boards. It is assisted by a group of experts representing local authorities, county councils, environmental NGOs, and the business sector.

[70] These objectives can be found here.

The statistics were compiled by grouping expenditures into three categories: expenditures directly linked to environmental improvement, expenditures potentially damaging to the environment, and other activities performed by the state. The last category is the largest and covers activities such as transfers, education, and labor market.

Regarding the most emission-intensive industries—for example, agriculture and transport—the government expenditures were divided into the relevant group depending on the activity. Within agriculture, expenditures like "Environmental efforts in agriculture" were allocated directly to the environment-related group, while expenditures such as "area support and livestock subsidies" were allocated to the potentially environmentally damaging group. Within transport, expenditures that go to road maintenance and airports were allocated to potentially environmentally damaging, while those for railways and public transport were allocated to the other government activities group. Entire expenditure areas do not, therefore, go to types of activities that are considered to damage the environment. Each appropriation has instead been evaluated on the basis of the budget bills.

Environment-related government expenditures amount to 1.6 percent of the state budget and this proportion did not change over the 1995–2006 period. The amount has however increased from almost SKr 5 billion to just over SKr 12 billion. Funding of activities that may harm the environment amounts to about 4 percent of the total budget. This can relate to major infrastructure projects or support to agriculture, the design of which may contribute to overproduction. The major part of the state budget goes to activities that are not particularly harmful to the environment, however. Such activities relate, for example, to providing financial security for children, families, and pensioners.

The report also described other instruments such as environmental taxes, environmental sanction charges, emissions trading, and electricity certificate trading. The general impression is that these instruments have benefits and special taxes have been used to good effect.

Evaluations of the latest instruments, such as emissions trading and electricity certificates, show that further adjustments to the systems must be made before the anticipated effects can be realized. As far as the transport sector is concerned, neither the Kyoto Protocol nor the environmental taxes cover international transports.

The report demonstrates a way of monitoring environmental-economic policy instruments, including the state budget. A certain part of the state budget is allocated to environmental work, whereas other parts are allocated to activities that indirectly lead to increased environmental impact. This suggests there may be alternative ways of allocating the expenditures in order to reduce environmental impact from the most intensive industries. This can be effected either by providing

financial incentives outside the framework of the state budget to reduce emission intensities or by reforming currently allocated expenditures.

### *Sweden, Account 9 – Environmental Protection Expenditures Account*

In this study, the Swedish National Institute of Economic Research estimates firms' probability of technological adoption during 2000–03 as measured by environmental protection investments, with a particular focus on differences between the decisions to adopt end-of-pipe solutions and "clean technology."

According to the results, the probability of a firm adopting clean technologies is larger if the firm has research and development (R&D) expenditures related to environmental protection. This factor seems to be of less importance in explaining adoption of end-of-pipe solutions. The researchers also found that firms' energy expenditures as share of revenues helped explain adoption of end-of-pipe solutions, while this factor was not significant for clean technologies. Moreover, end-of-pipe solutions and clean technologies seem to be complements: when firms decide to invest, they are likely to invest in both types of technologies.

In terms of policy implications, the study draws several conclusions. First, the investment complementarity indicates that adoption of one of the technologies stimulates investments in the other. However, green R&D and energy expenditures affect investment in the two types of environmental protection technologies differently. Thus, in order to increase adoption of clean technologies and end-of-pipe solutions, different policies may be used. Still, even though clean technologies are, typically, preferred over end-of-pipe solutions due to their generally higher potential of reducing emissions and the possibility to spur technological diffusion, it is hard to argue that clean technologies should always be preferred. From an environmental policy perspective, it is important to stimulate both types of technologies.

Second, though the paper did not explicitly study the effects of R&D policies, the results show that prior investments in R&D are correlated with adoption of clean technology, supporting the notion that R&D policies (for example, subsidies) can stimulate adoption of clean technologies. The results indicate that there is a rationale for looking for complementary policies other than the use of environmental taxes. This does not mean that taxes should be abandoned as a policy tool, but rather that policy measures that support the taxes can be useful.

## United Kingdom

The United Kingdom's environmental accounts are produced by the Office of National Statistics.

About half of the accounts in the United Kingdom are compiled on an annual basis. Most the remaining accounts are produced only occasionally. The Waste Account is produced once every three years.

The accounts are compiled for the country as a whole except for the Water Use Account, which is compiled subnationally using political boundaries.

The accounts cover (where relevant) all sectors of the economy. The exceptions are the two Environmental Protection Expenditure Accounts, which are published for the business and government sectors only.

The main users and uses of the United Kingdom's accounts are discussed in detail following the summary table below. The users and uses are summarized in Annex 11.

## Summary of Environmental Accounts Compiled, *United Kingdom*, 2013

| | Name | Frequency | Geographic scope | Sectoral scope | Start year | End year | Staff costs | Comments | Web link |
|---|---|---|---|---|---|---|---|---|---|
| **Account 1** | Air Emissions Account | Annual | National | All sectors | 1990 | 2012 | n/a | | Click here |
| **Account 2** | Water Use Account | Occasional | Subnational (political boundaries) | All sectors | 2007 | 2007 | n/a | Data cover England and Wales only. | Click here |
| **Account 3** | Energy Use Account | Annual | National | All sectors | 1990 | 2010 | n/a | Data for particulate matter, carbon monoxide and non-methane volatile hydrocarbons are for 2010 only. | Click here |
| **Account 4** | Environmental Protection Expenditures Account, Government | Annual | National | Government sector | 1996 | 2010 | n/a | | Click here |
| **Account 5** | Environmental Protection Expenditures Account, Industry | Occasional | National | Business sector | 2009 | 2009 | n/a | | Click here |
| **Account 6** | Environmental Taxes Account | Annual | National | All sectors | 1993 | 2011 | n/a | | Click here |
| **Account 7** | Economy-wide Material Flow Account | Annual | National | All sectors | 1970 | 2010 | n/a | | Click here |
| **Account 8** | Energy Resource Account | Annual | National | All sectors | 1989 | 2010 | n/a | Crude oil and natural gas are the only resources measured. | Click here |
| **Account 9** | Forest Resource Account | Occasional | National | All sectors | 1924 | 2011 | n/a | Monetary accounts exist for 1993, 1998,2003, 2008, and 2011 only. | Click here |
| **Account 10** | Fish Resource Account | Occasional | National | All sectors | 2001 | 2001 | n/a | Production of the Fish Resource Account is currently under suspension. | Click here |
| **Account 11** | Land Cover/Use Account | Occasional | National | All sectors | 1924 | 2010 | n/a | The length of the time series varies for different land uses. | Click here |
| **Account 12** | Solid Waste Account | Triennial | National | All sectors | 1998 | 2008 | n/a | | Click here |

Note: n/a = not available

# Highlights of Users and Uses – *United Kingdom*

### *United Kingdom, Accounts 1 and 3 – Air Emissions and Energy Use Accounts*

It has long been argued that the progress of the country should not be measured by looking just at growth in GDP. For a full picture of how a country is doing we need to look at wider measures of economic and social progress, including the impact on the environment. Recognizing this, the Prime Minister of the United Kingdom asked the U.K. Office for National Statistics (ONS) to prepare a new set of statistics measuring the development of well-being in the United Kingdom.

Wider and systematic consideration of well-being has the potential to lead to better decisions by government, markets, and the public and, as such, better outcomes. Measuring national well-being is about looking at "GDP and beyond." It includes headline indicators in areas such as health, relationships, job satisfaction, economic security, education, environmental conditions, and measures of "personal well-being" (individuals' assessment of their own well-being).

The first phase of the U.K. program in 2011 entailed a national debate that gathered views on what matters to people. Since then, work has focused on development of new statistical measures of well-being, including measures that are derived from the U.K. Air Emissions Account (particulate matter).

In November 2012, the program released its first annual report, *Life in the UK,* which included the national well-being "wheel of measures" (see above). Updated "wheels" were published in May 2013 and September 2013.

The ONS notes that an integrated environmental accounting framework showing links between stocks of natural capital, flows of ecosystem services, and economic activity brings discipline to the organization of environmental and related data and is, therefore, a key tool for managing natural capital better.[71]

Putting statistical information into an accounting framework provides opportunities for the development of a wide range of derived indicators. Some of these will come from within self-contained accounts (for example, an index of the value of timber in forests). Other indicators can be derived by combining information from the wider national accounts (for example, the value of forestry in comparison to other forms of capital).

It is important to measure trends in different capital stocks in order to understand whether growth is sustainable and in order to manage these stocks better. This suggests that the benefits of natural capital accounting would increase as time series data develops, in order to assess trends and trade-offs between natural and other forms of capital. Equally, natural capital accounts provide the basis for assessing sustainability at composite, aggregate levels, to raise awareness of broad trends. In due course it may be possible to derive aggregate indicators of sustainability (for example, changes in the total value of natural capital, or of ecosystem goods and services) once the conceptual issues have been resolved and a reasonable range of ecosystems have been covered by the accounts.

The U.K. Department for Food, Environment and Rural Affairs (DEFRA) uses the Air Emissions Account for monitoring and targeting actions to reduce greenhouse gas emissions over the life cycle of products. Most of the applications involve integrating data from the accounts into input-output and/or supply-use tables.

Specific uses include the following:

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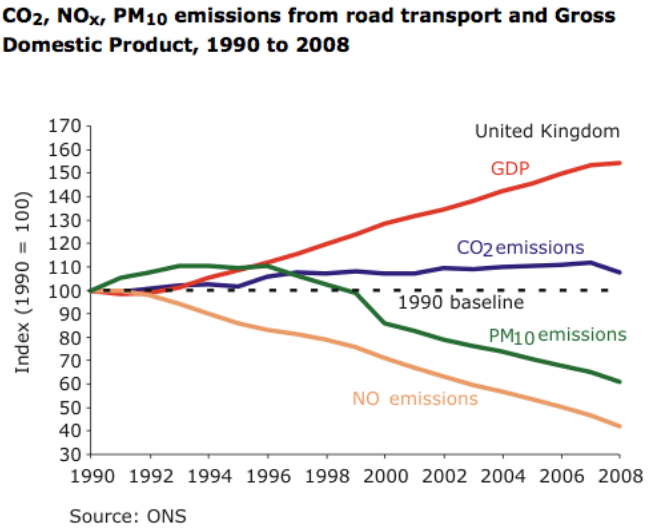
[71] U.K. Office for National Statistics, *Accounting for the Value of Nature in the UK: A Call for Views by the Office for National Statistics,* 2012, http://www.ons.gov.uk/ons/about-ons/get-involved/consultations/archived-consultations/2012/accounting-for-the-value-of-nature-in-the-uk/index.html.

- Annex 13 of the DEFRA/DECC guidance on company reporting of carbon emissions, which is used by companies to establish and hopefully then manage where emissions are likely to be occurring in the supply chain.
- U.K. carbon footprint calculation, which is a headline indicator in the U.K. National Sustainable Development Strategy, with supplementary analysis of particular industries in the U.K. supply chain for certain product groups/trading partners (see Economy-wide Material Flow Account below for a discussion of the U.K. Sustainable Development Strategy). Figure 20 below shows one of the indicators based on the Air Emissions Account.
- Use in analysis by the U.K. Climate Change Committee to model different scenarios for the reduction of the carbon footprint.
- Monitoring food chain emissions.
- Impacts of public sector procurement.
- Decomposition analysis.
- Potential use in Environmental Impact Assessments to assess the need to investigate the life cycle impacts of new policies.
- Monitoring of emissions by the water industry.

**Figure 20. U.K. Sustainable Development Indicator for Air Emissions**



### *United Kingdom, Account 7 – Economy-wide Material Flow Account*

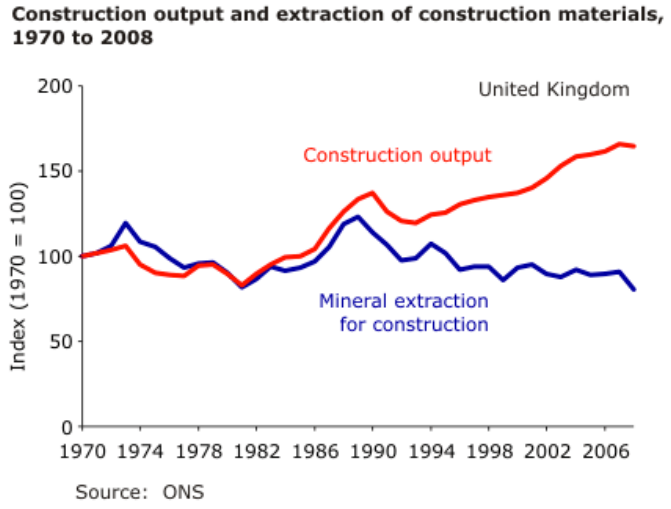
The main use of the U.K. Material Flow Account at the moment is for the calculation of the resource use indicator of the U.K. National Sustainable Development Indicators. According to the U.K. Sustainable Development Strategy, the goal of sustainable development is to ensure all people throughout the world are able to satisfy their basic needs, while making sure future generations can enjoy the same quality of life.[72]

Sustainable development recognizes the interconnections between society, the environment, and economy—and aims to use a holistic approach to find solutions that deliver benefits for all of these while minimizing negative impacts. Our long-term economic growth relies on protecting and enhancing the environmental resources that underpin it.

The resource use indicator measures domestic material consumption (DMC), the total mass of materials directly consumed by the economy (excluding waste from manufacture of imported goods).

The overall national indicator (see figure 21) shows that GDP more than doubled in real terms between 1970 and 2008, whereas DMC was slightly lower in 2008 than in 1979, having remained essentially stable since 1993.

**Figure 21. U.K. Resource Use Indicator**




[72] http://sd.defra.gov.uk/what/.

# Annexes

# Annex 1 – Details of Users and Uses, *Australia*, 2013

The users and uses of Australia's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Australia (see p. 12).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Australia. It is likely that there are users and uses that are not known to the producers of Australia's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Australia's environmental accounts presented on p. 13 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Greenhouse Gas Emissions Account, *Australia* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Department of the Environment | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The inventory is compiled by the Department of the Environment. |

## Water Use Account, *Australia* - Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Australian Productivity Commission | National government ministry or agency | Statistical analysis | Research | Click here | |
| **User 2** | Commonwealth Scientific and Industrial Research Organization | National government ministry or agency | Modeling/scenario analysis | Research | Click here | |

## Energy Use Account, *Australia* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Department of the Environment | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The inventory is compiled by the Department of the Environment |
| **User 2** | Australian Clean Energy Council | Nongovernmental organization | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | |

## Natural Resource Stock Accounts, *Australia* – Users and Uses[73]

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

[73] This table summarizes the users of the following Natural Resource Stock Accounts: Energy Resource Accounts, Mineral Resource Accounts, Timber Resource Accounts, Land Resource Accounts, all of which are compiled formally as part of the Australian National Balance Sheet Accounts.

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Australian Bureau of Statistics, National Balance Sheet | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The Resource Stock Accounts are compiled formally as part of the Australian National Balance Sheet Accounts. |
| **User 1** | Australian Bureau of Statistics, *Measuring Australia's Progress* | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Measuring Australia's Progress* is a periodic assessment of the evolution of Australia's economy, society and environment using a range of indictors. |

## Experimental Land Cover/Use Account, Australia – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Great Barrier Reef Marine Park Authority (GBRMPA) | Regional government ministry or agency | Reporting | Public decision making | Click here | This use is hypothetical, since the Land Use Account is considered experimental at the moment. If it were regularly produced the GBRMPA would be expected to be a user. |

## Experimental Solid Waste Account, *Australia* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Department of the Environment | National government ministry or agency | Reporting | Public decision making | Click here | |

# Annex 2 – Details of Users and Uses, *Canada*, 2013

The users and uses of Canada's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Canada (see p. 25).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Canada. It is likely that there are users and uses that are not known to the producers of Canada's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Canada's environmental accounts presented on p. 26 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Canada* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Ministry of Finance | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 2** | Canadian Ministry of Foreign Affairs and International Trade | National government ministry or agency | Modeling/scenario analysis | Public decision making | | |
| **User 3** | Canadian Ministry of the Environment | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 4** | Professors Tombe and Winter, | Academic/research institution | Modeling/scenario analysis | Research | Click here | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | University of Calgary | | | | | |
| **User 5** | Professors Hayami and Nakamura, University of British Columbia and Keio University | Academic/research institution | Modeling/scenario analysis | Research | Click here | |
| **User 6** | BullFrog Power | Corporation | Other | Other | Click here | Green energy company Bullfrog Power incorporated data from a study of household greenhouse gas emissions conducted by Statistics Canada into marketing materials for a new product—"green" natural gas—that it was bringing to market. |
| **User 7** | Professor Peter Victor, York University | Academic/research institution | Modeling/scenario analysis | Research | Click here | |
| **User 8** | Professors Jennifer Winter and Michael Moore, University of Calgary | Academic/research institution | Modeling/scenario analysis | Research | Click here | |

## Water Use Account, *Canada* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Ministry of the Environment | National government ministry or agency | Indicator compilation | Informing the general public | Click here | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 2** | Professor Steven Renzetti, Brock University | Academic/research institution | Modeling/scenario analysis | Research | Click here | J. Bruneau, S. Renzetti and M. Villeneuves, "Manufacturing Firms' Demand for Water Recirculation," *Canadian Journal of Agricultural Economics* 58 (2010): 515–530. |
| **User 3** | Ontario Water Technology Acceleration Program | Nongovernmental organization | Reporting | Informing the general public | | |
| **User 4** | Conference Board of Canada | Consultant | Indicator compilation | Informing the general public | Click here | |

## Energy Use Account, *Canada* – Users and Uses

See Greenhouse Gas Emissions Account above.

## Mineral Resource Account, *Canada* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Centre for the Study of Living Standards | Academic/research institution | Indicator compilation | Informing the general public | Click here | |
| **User 2** | Canadian Index of Wellbeing | Academic/research institution | Indicator compilation | Informing the general public | Click here | |
| **User 3** | Canadian Intergovernmental Conference Secretariat | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or | Click here | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | international organizations) | | |
| **User 4** | Canadian Ministry of the Environment | National government ministry or agency | Other | Public decision making | Click here | The ministry made use of data from the Mineral Resource Account to show the economic importance of mineral resources to the Canadian economy. |

## Energy Resource Account, *Canada* – Users and Uses

See Mineral Resource Account above.

## Water Resource Account, *Canada* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Index of Wellbeing | Academic/research institution | Indicator compilation | Informing the general public | Click here | |

## Timber Resource Account, *Canada* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Index of Wellbeing | Academic/research institution | Indicator compilation | Informing the general public | Click here | |
| **User 2** | Pembina Institute | Nongovernmental organization | Reporting | Informing the general public | Click here | |
| **User 3** | Professor Peter Victor, York University | Academic/research institution | Modeling/scenario analysis | Research | Click here | |

## Land Use/Cover Account, *Canada* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Federation of Municipalities | Nongovernmental organization | Reporting | Informing the general public | Click here | |

## Solid Waste Account, *Canada* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Canadian Index of Wellbeing | Academic/research institution | Indicator compilation | Informing the general public | Click here | |
| **User 2** | Recycling Council of Ontario | Nongovernmental organization | Reporting | Informing the general public | Click here | |
| **User 3** | Ontario Ministry of Environment | Regional government ministry or agency | Reporting | Public decision making | Click here | |
| **User 4** | Conference Board of Canada | Consultant | Indicator compilation | Informing the general public | Click here | |
| **User 5** | ECO Canada | Consultant | Reporting | Informing the general public | Click here | |

## Environmental Protection Expenditures Account, *Canada* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Institute for Research on Public Policy | Nongovernmental organization | Reporting | Informing the general public | Click here | |
| **User 2** | Canada West Foundation | Academic/research institution | Reporting | Informing the general public | Click here | |
| **User 3** | ECO Canada | Consultant | Reporting | Informing the general public | Click here | |
| **User 4** | Canadian Ministry of Natural Resources | National government ministry or agency | Reporting | Informing the general public | Click here | |
| **User 5** | Commissioner of the Environment and Sustainable Development | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | |

## Environmental Goods and Services Account, *Canada* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Professors Jennifer Winter and Michael Moore, University of Calgary | Academic/research institution | Modeling/scenario analysis | Research | Click here | |

# Annex 3 – Details of Users and Uses, *Denmark*, 2013

The users and uses of Denmark's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Denmark (see p. 51).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Denmark. It is likely that there are users and uses that are not known to the producers of Denmark's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Denmark's environmental accounts presented on p. 52 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Denmark* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Statistics Denmark | National government ministry or agency | Indicator compilation | Informing the general public | Click here | Including input-output analysis |
| **User 2** | Danish Energy Agency | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 3** | The Environmental Economic Council | Academic/research institution | Modeling/scenario analysis | Public decision making | Click here | |
| **User 4** | Eurostat | International organization | Reporting | Public decision making | | |

## Energy Use Account, *Denmark* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Statistics Denmark | National government ministry or agency | Modeling/scenario analysis | Informing the general public | Click here | |
| **User 2** | Danish Energy Agency | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 3** | The Environmental Economic Council | Academic/research institution | Modeling/scenario analysis | Public decision making | Click here | |
| **User 4** | Danish Energy Agency | National government ministry or agency | Other | Other | | Used in the compilation of energy balances |
| **User 5** | Statistics Denmark | National government ministry or agency | Indicator compilation | Informing the general public | | Including input-output analysis |
| **User 6** | Statistics Denmark | National government ministry or agency | Other | Other | | Input in national accounts (supply and use tables) |

## Material Flow Account, *Denmark* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Statistics Denmark | National government ministry or agency | Indicator compilation | Informing the general public | | |
| **User 2** | Eurostat | International organization | Reporting | Public decision making | | |

## Environmental Taxes Account, *Denmark* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Statistics Denmark | National government ministry or agency | Indicator compilation | Informing the general public | | |
| **User 2** | Eurostat | International organization | Reporting | Public decision making | | |

# Annex 4 – Details of Users and Uses, *Finland*, 2013

The users and uses of Finland's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Finland (see p. 51).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Finland. It is likely that there are users and uses that are not known to the producers of Finland's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Finland's environmental accounts presented on p. 52 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Thule Institute, University of Oulu | Academic/research institution | Modeling/scenario analysis | Public decision making | Click here | |
| **User 2** | Thule Institute, University of Oulu | Academic/research institution | Modeling/scenario analysis | Informing the general public | Click here | |

## Material Flow Account, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Thule Institute, University of Oulu | Academic/research institution | Modeling/scenario analysis | Public decision making | Click here | |
| **User 2** | Ministry of the Employment and Economy | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 3** | Ministry of the Environment | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 4** | Environmental Institute – SYKE | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |
| **User 5** | Prime Minister's Office | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | |

## Waste Emissions Account, *Finland* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Thule Institute, University of Oulu | Academic/research institution | Modeling/scenario analysis | Public decision making | Click here | |
| **User 2** | Environmental Institute - SYKE | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |

## Environmental Taxes Account, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of Finance | National government ministry or agency | Statistical analysis | Public decision making | Click here | |
| **User 2** | Ministry of the Environment | National government ministry or agency | Statistical analysis | Public decision making | Click here | |

## Environmental Protection Expenditure Account, Business Sector, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Confederation of Finnish Industries | Corporation | Statistical analysis | Private decision making | Click here | |
| **User 2** | Ministry of the Environment | National government ministry or agency | Statistical analysis | Public decision making | Click here | |

## Timber Resource Account, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | VTT Technical Research Centre of Finland | Academic/research institution | Statistical analysis | Public decision making | Click here | |

## Environmental Protection Expenditure Account, Public Sector, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of the Environment | National government ministry or agency | Statistical analysis | Public decision making | | |

## Environmental Goods and Services Sector Account, *Finland* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Confederation of Finnish Industries | Corporation | Statistical analysis | Private decision making | Click here | |
| **User 2** | Ministry of the Environment | National government ministry or agency | Statistical analysis | Public decision making | Click here | |

# Annex 5 – Details of Users and Uses, *Germany*, 2013

The users and uses of Germany's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Germany (see p. 62).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Germany. It is likely that there are users and uses that are not known to the producers of Germany's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Germany's environmental accounts presented on p. 63 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Germany* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Federal Government of Germany | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Monitoring of the German Federal Sustainable Development Strategy |
| **User 2** | German Institute of Economic Structure Research (GWS) | Academic/research institution | Modeling/scenario analysis | Research | Click here | Panta Rhei is an environmentally extended version of the macroeconometric simulation and forecasting model of the German economy operated by the Institute for Economic Structure Research. In recent years, the model has been used for studies of renewable energy with a focus on the labor market, energy efficiency, green information technology ICT, material efficiency, and energy |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | scenarios for the German energy future. |

## Water Use Account, *Germany* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Federal Government of Germany | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Monitoring of the German Federal Sustainable Development Strategy |

## Energy Use Account, *Germany* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | German Institute of Economic Structure Research (GWS) | Academic/research institution | Modeling/scenario analysis | Research | Click here | Panta Rhei is an environmentally extended version of the macroeconometric simulation and forecasting model of the German economy operated by the Institute for Economic Structure Research. In recent years, the model has been used for studies of renewable energy with a focus on the labor market, energy efficiency, green information technology ICT, material efficiency, and energy scenarios for the German energy future. |

## Economy-wide Material Flow Account, *Germany* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Federal Government of Germany | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or | Click here | Monitoring of the German Federal Sustainable Development Strategy |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | international organizations) | | |
| **User 2** | German Institute of Economic Structure Research (GWS) | Academic/research institution | Modeling/scenario analysis | Research | Click here | Panta Rhei is an environmentally extended version of the macroeconometric simulation and forecasting model of the German economy operated by the Institute for Economic Structure Research. In recent years, the model has been used for studies of renewable energy with a focus on the labor market, energy efficiency, green information technology ICT, material efficiency, and energy scenarios for the German energy future. |

## Waste Emissions Account, *Germany* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Federal Government of Germany | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Monitoring of the German Federal Sustainable Development Strategy |

## Land Use Account, *Germany* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Federal Government of Germany | National government ministry or agency | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Monitoring of the German Federal Sustainable Development Strategy |

# Annex 6 – Details of Users and Uses, *Italy*, 2013

The users and uses of Italy's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Italy (see p. 68).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Italy. It is likely that there are users and uses that are not known to the producers of Italy's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Italy's environmental accounts presented on p. 69 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Italy* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Department of economics and Management, University of Ferrara | Academic/research institution | Modeling/scenario analysis | Research | Click here | |
| **User 2** | Catholic University of Milan & CERIS CNR Milan | Academic/research institution | Modeling/scenario analysis | Research | Click here | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | Department of Economics, University of Roma III | Academic/research institution | Modeling/scenario analysis | Research | Click here | Based on regional air emissions data that we only produced once; the papers listed for users 1, 2, 3, 5 are part of a long list of publications using air emission accounts data for Italy mainly from the same group of authors (Mazzanti, Zoboli, Marin, Costantini, Montini), all of them belonging to academic institutions. |
| **User 4** | Department of Economics, University of Torino | Academic/research institution | Modeling/scenario analysis | Research | Click here | |
| **User 5** | IMT Lucca Institute for Advanced Studies | Academic/research institution | Modeling/scenario analysis | Research | Click here | |
| **User 6** | Institute for Environmental Protection and Research, ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) | National government ministry or agency | Modeling/scenario analysis | Informing the general public | Click here | see pages 31-41 in the hyperlinked document (in Italian only) |
| **User 7** | Ministry of Environment | National government ministry or agency | Statistical analysis | Informing the general public | Click here | see page 40 in the hyperlinked document |
| **User 8** | Centro di Ricerche e Studi sui Problemi del Lavoro, dell'Economia | Consultant | Modeling/scenario analysis | Public decision making | | Evaluation of the impact of the National Strategic Framework for the planning of the Community Structural Funds on emissions by industrial sector. Unknown if they will be a regular user; up to now have used the data twice. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | e dello Sviluppo | | | | | |
| **User 9** | Eurostat | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 10** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | See "national accounts" – "environmental and other satellite accounts." |

## Energy Use Account, *Italy* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Universities, in Italy and abroad, several | Academic/research institution | Statistical analysis | Research | | |
| **User 2** | Centro di Ricerche e Studi sui Problemi del Lavoro, dell'Economia e dello Sviluppo | Consultant | Modeling/scenario analysis | Public decision making | | Evaluation of the impact of the National Strategic Framework for the planning of the Community Structural Funds on emissions by industrial sector. Unknown if they will be a regular user; up to now have used the data twice. |
| **User 3** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | See last three links. |
| **User 4** | Istat | National government ministry or agency | Other | Other | | Internal use within national accounts |

## Material Flow Account, *Italy* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 2** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | See "national accounts" – "environmental and other satellite accounts." |
| **User 3** | OECD | International organization | Indicator compilation | Informing the general public | | |
| **User 4** | EEA | International organization | Indicator compilation | Informing the general public | | |

## Environmental Taxes Account, *Italy* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 2** | OECD | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 3** | Unione Petrolifera | Other | Reporting | Informing the general public | Click here | Unione Petrolifera is an association of the main Italian oil producing and distributing companies; for environmental tax revenue see Tavola 96 (in Italian). |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 4** | Ministry of Environment | National government ministry or agency | Statistical analysis | Informing the general public | Click here | see page 105 |
| **User 5** | Ministry of Economy - Finance Department | National government ministry or agency | n/a | Informing specialized audiences (e.g., parliamentarians or international organizations) | | |
| **User 6** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | See "national accounts" – "environmental and other satellite accounts." |

## Environmental Expenditures Account, National Level, *Italy* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Statistical analysis | Informing the general public | Click here<br><br>Click here | |
| **User 2** | OECD | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 3** | Ministry of Environment | National government ministry or agency | Statistical analysis | Informing the general public | | |
| **User 4** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | |

## Environmental Expenditures Account, Regional Level, *Italy* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Statistical analysis | Informing the general public | Click here | |
| **User 2** | Ministry of environment | National government ministry or agency | Statistical analysis | Public decision making | | Evaluation of resources devoted to specific environmental items (e.g., biodiversity, marine environment), in the context of the design of specific policy initiatives implementing EU directives (e.g., definition of national marine strategy) |
| **User 3** | Istat | National government ministry or agency | Reporting | Informing the general public | Click here | |
| **User 4** | Istat | National government ministry or agency | Other | Other | | Internal use within national accounts |

# Annex 7 – Details of Users and Uses, *Mexico*, 2013

The users and uses of Mexico's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Mexico (see p. 74).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Mexico. It is likely that there are users and uses that are not known to the producers of Mexico's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Mexico's environmental accounts presented on p. 75 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Mexico* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, Second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–18<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | Climate Change Act. Article 22, Section XV |
| **User 4** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 5** | Secretariat of Environment and Natural Resources | National government ministry or agency | Modeling/scenario analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | "Estimaciones del impacto del cambio climático, desde el Sistema de Cuentas Económicas y Ecológicas de México. 2010-2100" (Secretariat of Environment and Natural Resources-SEMARNAT). |
| **User 6** | Dr. Francisco Almagro Vázquez, Instituto Politécnico Nacional | Academic/research institution | Other | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Book: *Cuentas ecológicas y desarrollo sustentable. La experiencia de México*. Presents exercises for the study of environmental accounts. |
| **User 7** | National Statistics Institute of Spain | Other | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Article: "Cuentas Satélite, un enfoque funcional de la contabilidad nacional: La experiencia de México," *Revista Estadística Española* Vol. xx, no. xx (2012): 263–286. |
| **User 8** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years. |

## Water Emissions Account, *Mexico* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years. |

## Groundwater Depletion Account, *Mexico* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years. |

## Waste Emission Account, *Mexico* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years |

## Environmental Protection Expenditure Account, *Mexico* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Dr. Francisco Almagro Vázquez, Instituto Politécnico Nacional | Academic/research institution | Other | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Book: *Cuentas ecológicas y desarrollo sustentable. La experiencia de México*. Presents exercises for the study of environmental accounts. |
| **User 2** | National Statistics Institute of Spain | Other | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Article: "Cuentas Satélite, un enfoque funcional de la contabilidad nacional: La experiencia de México," *Revista Estadística Española* Vol. xx, no. xx (2012): 263–286. |
| **User 3** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 4** | Organisation for Economic Co-operation and Development | International organization | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | OECD. Environmental Data. *Données OCDE sur l'environment.* COMPENDIUM 2006/2007. Environmental Expenditure and Taxes. |

## Oil and Gas Depletion Account, *Mexico* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Dr. Francisco Almagro Vázquez, Instituto Politécnico Nacional | Academic/research institution | Other | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Book: *Cuentas ecológicas y desarrollo sustentable. La experiencia de México*. Presents exercises for the study of environmental accounts. |
| **User 5** | | | | | | |

## Timber Resource Account, *Mexico* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Dr. Francisco Almagro Vázquez, Instituto Politécnico Nacional | Academic/research institution | Other | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Book: *Cuentas ecológicas y desarrollo sustentable. La experiencia de México*. Presents exercises for the study of environmental accounts. |
| **User 5** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years |

## Land Cover/Land Use Account, *Mexico* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | -Page 77, second column, first paragraph<br>-National Development Plans, 2001–06, 2007–12, 2013–18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 2** | Secretariat of Environment and Natural Resources | National government ministry or agency | Other | Informing the general public | Click here | -Sector Program Environment and Natural Resources 2013–2018<br>-Page 21, second column, last paragraph |
| **User 3** | Presidency of Republic | National government ministry or agency | Other | Informing the general public | Click here | General Law of Ecological Balance and Environmental Protection. Article 15, Section XIX |
| **User 4** | Dr. Francisco Almagro Vázquez, Instituto Politécnico Nacional | Academic/research institution | Other | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Book: *Cuentas ecológicas y desarrollo sustentable. La experiencia de México*. Presents exercises for the study of environmental accounts. |
| **User 5** | Secretariat of Environment and Natural Resources | National government ministry or agency | Indicator compilation | Informing the general public | Click here | *Compendio de Estadísticas Ambientales*. Several years |

## System of Environmental and Economic Accounts for Water, *Mexico* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | UN World Water Assessment Program and UNSD | International organization | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Monitoring Framework for Water |

# Annex 8 – Details of Users and Uses, *Netherlands*, 2013

The users and uses of Netherlands's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Netherlands (see p. 74).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Netherlands. It is likely that there are users and uses that are not known to the producers of Netherlands's accounts and that are not easily discovered *via* the Internet.

If an account listed in the summary table of Netherlands's environmental accounts presented on p. 80 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Reporting | | | Part of legal base |
| **User 2** | PBL (environmental planning agency) | National government ministry or agency | Modeling/scenario analysis | Public decision making | | |

## Water Emissions Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of Infrastructure and the Environment | National government ministry or agency | Reporting | Public decision making | | Reporting to the water framework directive |
| **User 2** | Ministry of Infrastructure and the Environment | National government ministry or agency | Indicator compilation | | Click here | Reporting to the marine directive |

## Water Use Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of Infrastructure and the Environment | National government ministry or agency | Reporting | Public decision making | | Reporting to the water framework directive |
| **User 2** | Water companies | Corporation | Modeling/scenario analysis | Private decision making | | |

## Energy Use Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | ECN (national energy research institute) | Academic/research institution | Modeling/scenario analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | | |
| **User 2** | Eurostat | International organization | Reporting | | | Part of upcoming legal base |

## Material Flow Account, *Netherlands* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of Economic Affairs | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | Resource efficiency |
| **User 2** | Eurostat | International organization | Reporting | | | Part of legal base |

## Environmental Subsidies Account, *Netherlands* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Agentschap NL | National government ministry or agency | Reporting | Public decision making | Click here | Evaluation of environmental subsidies |

## Environmental Taxes Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Reporting | | | Part of legal base |

## Environmental Protection Expenditure Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of Infrastructure and the Environment | National government ministry or agency | Reporting | Public decision making | | |
| **User 2** | PBL (environmental planning agency) | National government ministry or agency | Modeling/scenario analysis | Public decision making | | Also for research |
| **User 3** | Eurostat | International organization | Reporting | | | Part of legal base |

## Environmental Goods and Services Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Reporting | | | Part of upcoming legal base |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 2** | Ministry of Economic Affairs | National government ministry or agency | Reporting | Public decision making | Click here | Report on the sustainable energy sector |
| **User 3** | PBL (environmental planning agency) | National government ministry or agency | Modeling/scenario analysis | Research | | |
| **User 4** | Branch organization for environmental companies | Corporation | Reporting | Private decision making | | |

## Energy Resource Account, *Netherlands* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of economic affairs | National government ministry or agency | Reporting | Public decision making | | |

## Land Use/Land Cover Account, *Netherlands* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Ministry of the environment and infrastructure | National government ministry or agency | Reporting | Public decision making | | |
| **User 2** | PBL (environmental planning agency) | National government ministry or agency | Modeling/scenario analysis | Public decision making | | |

## Pollution Emission Permit Account, *Netherlands* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | National emission authority | National government ministry or agency | Reporting | Public decision making | | |

# Annex 9 – Details of Users and Uses, *Norway*, 2013

The users and uses of Norway's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Norway (see p. 74).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Norway. It is likely that there are users and uses that are not known to the producers of Norway's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Norway's environmental accounts presented on p. 80 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account/Air Emissions Inventory, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual Reporting of Emissions of Greenhouse Gases Statistics |
| **User 2** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The Norwegian Emissions Inventory |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Report on Sustainable Development Indicators |
| **User 4** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Used in the integrated Economic and Environmental Accounts |
| **User 5** | Research Department (SN) | National government ministry or agency | Modeling/scenario analysis | Research | Click here | |
| **User 6** | UNFCCC | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Figures from the emission inventory are being used by the Ministry of the Environment and the Climate and Pollution Agency (Klif) in annual reports to the UNFCCC. These figures state whether Norway has reached its targets or not. |
| **User 7** | Norwegian Environment Agency | National government ministry or agency | Reporting | Public decision making | Click here | |
| **User 8** | Ministry of Finance | National government ministry or agency | Indicator compilation | Public decision making | Click here | |
| **User 9** | Ministry of the Environment | National government ministry or agency | Modeling/scenario analysis | Public decision making | Click here | |

## Water Emissions Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual reporting of the Waste Water statistics |
| **User 2** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Reports and publications |
| **User 3** | Ministry of the Environment | National government ministry or agency | Modeling/scenario analysis | Public decision making | | |
| **User 4** | County administrations and municipalities | Regional government ministry or agency | Reporting | Public decision making | | |
| **User 5** | Norwegian Environment Agency | National government ministry or agency | Reporting | Public decision making | | Data are collected by Statistics Norway on behalf of the Norwegian Pollution Authority with legal basis in the Pollution Control Act (13th March, 1981, no. 6). |
| **User 6** | EUROSTAT/OECD and EFTA Surveillance Authority (ESA) | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | | The statistics is reported to EUROSTAT/OECD and EFTA Surveillance Authority (ESA). |

## Water Use Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Natural Resources and | National government ministry or agency | Reporting | Informing the general public | Click here | Division for Natural Resources and Environmental Statistics (SN) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Environmental Statistics (SN) | | | | | |
| **User 2** | Ministry of Health and Care Services | National government ministry or agency | Indicator compilation | Public decision making | Click here | Ministry of Health and Care Services |
| **User 3** | Ministry of Local Government and Regional Development | National government ministry or agency | Indicator compilation | Public decision making | Click here | Ministry of Local Government and Regional Development |

## Energy Use Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual publication of energy account and energy balance statistics |
| **User 2** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing the general public | Click here | Used as a basis for calculation of greenhouse gas emissions |
| **User 3** | Division for National Accounts (SN) | National government ministry or agency | Reporting | Informing the general public | | |
| **User 4** | Research Department (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Used for analyses and prognoses |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 5** | IEA/OECD, Eurostat and the UN | International organization | Indicator compilation | Public decision making | | The energy sources balance sheet is reported annually to the IEA/OECD, Eurostat and the UN. |

## Material Flow Account, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | | Publication of the statistics, September 2013 |
| **User 2** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Used in Report on Sustainable Development Indicators |
| **User 3** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Used in the integrated Economic and Environmental accounts |
| **User 4** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The data is used in the Norwegian Emissions Inventory. |
| **User 5** | Eurostat | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Waste Account for Norway is data source for reporting waste statistics to Eurostat pursuant to Regulation on waste statistics (No 2150/2002). |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 6** | EU/OECD | International organization | Indicator compilation | Public decision making | | Waste Account for Norway is data source for reporting waste statistics to EU/OECD (Joint Questionnaire). |

## Waste Emissions Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Publication of the statistics and accounts |
| **User 2** | Norwegian Environment Agency | National government ministry or agency | Reporting | Public decision making | Click here | |
| **User 3** | Eurostat | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Waste Account for Norway is data source for reporting waste statistics to Eurostat pursuant to Regulation on waste statistics (No 2150/2002). |
| **User 4** | EU/OECD | International organization | Indicator compilation | Public decision making | | Waste Account for Norway is data source for reporting waste statistics to EU/OECD (Joint Questionnaire). |

## Environmental Taxes Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | | Compilation of data starts fall 2013. |
| **User 2** | Research Department (SN) | National government ministry or agency | Modeling/scenario analysis | Research | Click here | |
| **User 3** | Eurostat | International organization | Indicator compilation | Informing the general public | | Data will be reported to EUROSTAT annually starting from 2013 according to the EU regulation 691/2011. |

## Environmental Protection Expenditure Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual survey and publication of the statistics on environmental expenditure in the mining, quarrying and manufacturing industries |
| **User 2** | Eurostat | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Biannual reporting to Eurostat according to the Structural Business Statistics Directive No. 58/97 |
| **User 3** | OECD/Eurostat | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Biannual reporting to the OECD/Eurostat joint questionnaire for environmental protection expenditure and revenues (JQ-EPER). |

## Environmental Goods and Services Account, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Work in progress in order to develop the statistics |
| **User 2** | Eurostat | International organization | Indicator compilation | Informing specialized audiences (e.g., parliamentarians or international organizations) | | Data will annually be reported to Eurostat in accordance to Regulation 691/2011 on European environmental economic accounts |

## Energy Resource Account, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Used in articles about the national wealth |
| **User 2** | Division for Energy and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Used in the report on sustainable wealth indicators |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | Research Department (SN) | National government ministry or agency | Modeling/scenario analysis | Research | Click here | Calculations of the national wealth |

## Timber Resource Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Primary Industry (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual publication of the statistics |
| **User 2** | Division for Primary Industry (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | The National Forest Inventory |
| **User 3** | Norwegian Forest and Landscape Institute | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Results from the National Forest Inventory are reported to international organizations by the Norwegian Forest and Landscape Institute. |

## Marine Resource Account, *Norway* – Users and Uses

| | **Name** | **User category** | **Type of use** | **Purpose of use** | **Web link or document** | **Comment** |
|---|---|---|---|---|---|---|
| **User 1** | Division for Primary Industry (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual publication of the statistics |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 2** | Directorate for Fisheries | National government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Publishes statistics on its website and reports to international organizations (Eurostat, FAO). |

## Land Cover/Land Use Account, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Reporting | Informing the general public | Click here | Annual publication of the statistics |
| **User 2** | Division for Natural Resources and Environmental Statistics (SN) | National government ministry or agency | Statistical analysis | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Data is used in "Cities and environment" publication |

## Non-timber Forest Resource Account, *Norway* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Division for Primary Industry (SN) | National government ministry or agency | Reporting | Informing the general public | Click here<br>Click here | Annual publication of the statistics |
| **User 2** | The Directorate for Nature Management | National government ministry or agency | Modeling/scenario analysis | Public decision making | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | County Departments of Environmental Affairs | Regional government ministry or agency | Modeling/scenario analysis | Public decision making | | |

# Annex 10 – Details of Users and Uses, *Sweden*, 2013

The users and uses of Sweden's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to Sweden (see p. 93).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for Sweden. It is likely that there are users and uses that are not known to the producers of Sweden's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of Sweden's environmental accounts presented on p. 93 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Swedish Environment Protection Agency | National government ministry or agency | Indicator compilation | Informing the general public | Click here<br>Click here | Only a couple examples of projects made in cooperation with SEPA. First publication in English; the second has an English summary. |
| **User 2** | Swedish Confederation for Professional Employees (TCO) | Nongovernmental organization | Statistical analysis | Informing the general public | Click here | Rio Ranking 2012:1 The climate-transition and the transition climate. There are a couple similar publications in English available on TCO website. |
| **User 3** | Various universities, | Academic/research institution | Modeling/scenario analysis | Other | | Between 2–4 Swedish universities request micro data access per year. |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 4** | Svenska Naturskyddsföreningen (Swedish Nature Conservation) | Nongovernmental organization | Reporting | Informing the general public | Click here | Providing data and text with relation to the climate impact of consumption |
| **User 5** | Eurostat | International organization | Reporting | Informing the general public | Click here | EC regulation 691/2011 |
| **User 6** | National Institute of Economic Research | National government ministry or agency | Modeling/scenario analysis | Informing the general public | | Data provision for their EMEC model |

## Water Use Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Water district authorities | Regional government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Commissioned by the water board authorities in order to respond to the EC water directive. A new publication is expected in September 2013 (www.scb.se/MI1301–EN). |

## Water Emissions Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Water district authorities | Regional government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Commissioned by the water board authorities in order to respond to the EC water directive. A new publication is expected in September 2013 (www.scb.se/MI1301-EN). |

## Energy Use Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Swedish Energy Agency | National government ministry or agency | Modeling/scenario analysis | Research | Not yet published, expected in autumn 2013 | Developing an energy model for off-road vehicles by industry breakdown |
| **User 2** | Various universities | Academic/research institution | Modeling/scenario analysis | Other | | Between 2–4 Swedish universities request micro data access per year. |

## Material Flow Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Reporting | Informing the general public | Click here | EC regulation 691/2011 |
| **User 2** | Swedish EPA/Swedish Chemical Agency | National government ministry or agency | Statistical analysis | Informing the general public | Click here | The Commodity Guide and its use in the work toward nontoxic and resource-saving cyclical systems |
| **User 3** | Eurostat | International organization | Statistical analysis | Research | Click here | MIR 2010:1 Domestic Inflow of Hazardous Substances |
| **User 4** | Swedish EPA (Environmental objectives council) | National government ministry or agency | Other | Research | Click here | Accounting for flows of fruit and vegetables in the food chain - method development based on MFA |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 5** | SCB/Medical Products Agency | National government ministry or agency | Statistical analysis | Informing the general public | Click here | Pharmaceuticals, cosmetic, and hygienic products in Sweden, method development for sales statistics and flow analysis |

## Environmental Subsidies Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Swedish Environment Protection Agency | National government ministry or agency | Statistical analysis | Informing the general public | Click here | Material for the Environmental Objectives Council's report on followup of Swedish quality objectives (2008) |

## Environmental Taxes Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Eurostat | International organization | Reporting | Informing the general public | Click here | EC regulation 691/2011 |
| **User 2** | Water district authorities | Regional government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Commissioned by the water board authorities in order to respond to the EC water directive. A new publication is expected in September 2013 (www.scb.se/MI1301-EN). |
| **User 3** | Various universities | Academic/research institution | Modeling/scenario analysis | Other | | Between 2–4 Swedish universities request micro data access per year. |

## Environmental Protection Expenditures Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Water district authorities | Regional government ministry or agency | Reporting | Informing specialized audiences (e.g., parliamentarians or international organizations) | Click here | Commissioned by the water board authorities in order to respond to the EC water directive. A new publication is expected in September 2013 (www.scb.se/MI1301-EN). |
| **User 2** | Eurostat | International organization | Reporting | Informing the general public | Click here | Structural Business Statistics Regulation EC 58/97, and OECD JQ EPER |
| **User 3** | Various universities | Academic/research institution | Modeling/scenario analysis | Other | | Between 2-4 Swedish universities request micro data access per year. |
| **User 4** | National Institute of Economic Research | National government ministry or agency | Modeling/scenario analysis | Informing the general public | Click here | Data provision |

## Environmental Goods and Services Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Enterprise, Energy and Communications Department | National government ministry or agency | Indicator compilation | Informing the general public | | New commission from 2013, to report EGSS and develop statistics related to environmental technologies sector |
| **User 2** | Regional authorities | Regional government ministry or agency | Statistical analysis | Informing the general public | | Various extractions from our database on EGSS in a specific region |

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 3** | Growth Analysis | National government ministry or agency | Statistical analysis | Informing the general public | | EGSS in Sweden |

## Timber Resource Account, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | European Commission | International organization | Statistical analysis | Research | | SCB is part of the consortium working on CREEA, of which we are responsible for forest accounts. Through this project, the SEEA 2012 propositions for forest accounts are being tried out within a pilot study in Sweden and one in Catalonia, Spain. Also a series of indicators from other international statistics on forest (State of European Forests and Forest Resource Assessment) that might be used in cohesion with forest accounts to get more information on environmental aspects. |

## Environmentally Extended Input-output Table, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | Swedish Environment Protection Agency | National government ministry or agency | Indicator compilation | Informing the general public | Click here<br>Click here | Only a couple examples of projects made in cooperation with SEPA. First publication in English; the second has an English summary. |

## Decomposition Analysis, *Sweden* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **User 1** | Swedish Environment Protection Agency | National government ministry or agency | Indicator compilation | Informing the general public | Click here<br>Click here | Only a couple examples of projects made in cooperation with SEPA. First publication in English; the second has an English summary. |

# Annex 11 – Details of Users and Uses, *United Kingdom*, 2013

The users and uses of the United Kingdom's environmental accounts that were identified during the research for this report are summarized below. The most important of these were described in detail above in the section of main report devoted to the United Kingdom (see p. 104).

The users and uses listed in the tables below do not necessarily represent an exhaustive list for the United Kingdom. It is likely that there are users and uses that are not known to the producers of the United Kingdom's accounts and that are not easily discovered via the Internet.

If an account listed in the summary table of the United Kingdom's environmental accounts presented on p. 105 does not appear among the accounts below, it is because no users and uses were discovered for that account.

## Air Emissions Account, *United Kingdom* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | U.K. Government | National government ministry or agency | Reporting | Informing the general public | Click here | The U.K. prime minister has assigned responsibility for measurement of national well-being to the U.K. Office of National Statistics; data on particulate matter from the environmental accounts are included in the well-being report. |
| **User 2** | U.K. Department of Environment, Food and Rural Affairs | National government ministry or agency | Statistical analysis | Public decision making | | DEFRA uses the greenhouse gas emissions accounts extensively, including for reporting indicators for the U.K. National Sustainable Development Strategy. |

## Energy Use Account, *United Kingdom* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | U.K. Government | National government ministry or agency | Reporting | Informing the general public | Click here | The U.K. prime minister has assigned responsibility for measurement of national well-being to the U.K. Office of National Statistics; data on the share of energy from renewable sources is taken from the environmental accounts for the well-being report. |
| **User 2** | Oakdene Hollins | Consultant | Statistical analysis | Public decision making | Click here | Study on resource efficiency |

## Material Flow Accounts, *United Kingdom* – Users and Uses

| | Name | User category | Type of use | Purpose of use | Web link or document | Comment |
|---|---|---|---|---|---|---|
| **User 1** | U.K. Department of Food, Environment and Rural Affairs | National government ministry or agency | Indicator compilation | Informing the general public | Click here | Use of the accounts in the compilation of indicators for the U.K. Sustainable Development Strategy |

## Annex 12 – Questionnaire Used to Gather Information from National Statistical Offices

The questionnaire that was sent to national statistical offices to gather information on the users and uses of their environmental accounts is attached below.

WB environmental accounting users and u


www.wavespartnership.org