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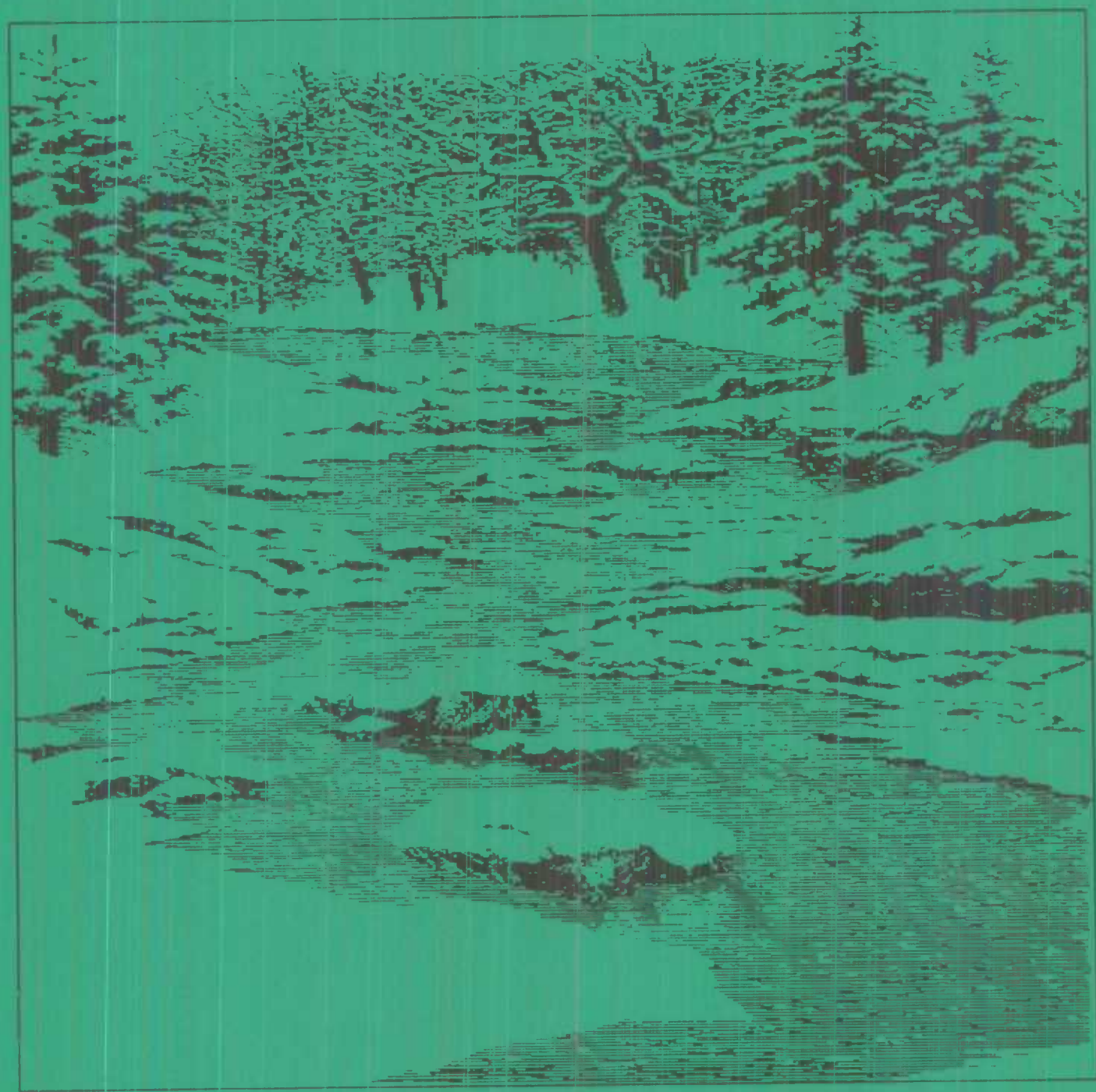

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Environment Spending and Government Accounting

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ENVIRONMENT SPENDING AND GOVERNMENT ACCOUNTING

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ENVIRONMENTAL SPENDING AND GOVERNMENT ACCOUNTING

1. INTRODUCTION

Canada is a country rich in natural resources and in the past it has taken them for granted and used them freely. However, like other countries, Canada has gradually become aware of the limits of its resource base. Its governments are directing their policies toward sustainable development with the consequence of generating a demand for supporting statistical frameworks and indicators. For nearly three years Statistics Canada has been involved in designing a new system of natural resource and environmental accounts, to be developed as a satellite to the existing Canadian national accounts. This work is part of the Green Plan project launched by the Canadian government in 1991[1]. The satellite account will have four distinct components: natural resource stock accounts (recorded in both physical and monetary terms), natural resource use accounts (recorded in physical terms), waste output accounts (recorded in physical terms) and environmental protection expenditure accounts[2]. With regards to the latter, we are interested in establishing the role of environmental protection expenditures in the Canadian production function (final demand and intermediary demand), as represented by an input-output structure. The input-output framework of Canada's system of national accounts (SNA) includes environmental expenditures made by the different sectors but does not show them explicitly. A set of satellite accounts will allow us to present detailed information on current and capital expenditures by businesses, governments and households that are intended to conserve or protect natural resources and the environment. We also plan to make a distinction inside those accounts between expenditures on environmental goods and services produced in Canada and those which are imported as well as domestic sales of Canadian environmental goods and services. The satellite account on environmental protection expenditures will provide answers to the following questions:

. how much does Canada spend on environmental protection and what form does the expenditure take ?
. what is the role of environmental protection in the Canadian production function ?
. how is the expenditure financed and who spends the money?
. how much effect have government policy and regulation changes on environmental protection spending ?

Eventually the natural resource accounts and waste output accounts will be linked to the

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[1]Canada's Green Plan is a comprehensive, multi-year government policy initiative involving actions related to human health protection, environment protection, sustainable development of forest, agriculture and fishery resources, protection of wildlife and its habitat and provision of more complete public information about Canada's environment.

[2]For more detail on the first three accounts, see Philip Smith (1994).

environmental protection expenditure account in order to obtain an understanding of the effects of spending on the environment. Some survey work has already been done on the business sector, with respect to pollution abatement expenditures and to revenues and expenses in the waste management industry[3]. The work that is presented in this paper on environmental accounting for the government sector is only one component of the satellite account of environmental expenditures but it is the first account that has been worked on.

The purpose of this paper is to present our thinking and work to date on the government component of the environmental expenditures account. Our goal is to identify and classify current and capital spending in Canada by each level of government[4] that is directed toward protecting or improving the quality of the environment. Information of this kind is needed by Environment Canada, provincial ministries, non government organisations, universities, ecological groups and by such international organisations as the OECD and the United Nations. In Canada the information is of particular use for evaluating the impacts of federal government spending, as part of the Green Plan, on provinces and municipalities: do provincial governments follow the federal government's lead in protecting or improving the quality of the environment ? and if they do, how so ? do they share the financial burden ? how? what are the impacts of federal and provincial government transfers on local governments ? Another important use for data on government spending toward environmental protection is to evaluate its impacts on preventing and reducing pollution and on recycling and saving natural resources. That is where an integration of the waste output and natural resource accounts with the expenditure account will be required.

After a brief survey of the work accomplished by the United Nations and Eurostat in developing accounting frameworks for environmental protection expenditures, the paper will present the classification of government expenditures that is used at Statistics Canada and compare it to the international classification of activities developed jointly by Eurostat and the Economic Commission for Europe. The paper will describe the data available so far in Canada and present a case study for 1991. It will discuss the limits attached to the Canadian data on government expenditures (lack of data, incompatibility of estimates from different sources) and ways to improve data collection. The paper will then present a comparison of the work done in Canada with the work done by other countries (including an international comparison by OECD of PAC expenditures as a percentage of GDP) with respect to public environmental protection expenditure

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[3] A first Pollution Abatement and Control (PAC) Survey was produced for 1989 and a Waste Management Industry Survey was also done that year. The first one is briefly described later in the paper. Addressed to both public and private sectors it focuses on PAC expenditures and amounts of pollution reduced. The waste management industry survey gathered information on revenues in that industry by type of service provided and on the categories of expenses faced by the industry. For more detail on those surveys, please see the two articles by Craig Gaston in Statistics canada's Environmental Perspectives 1993, cat. 11-528, "Pollution Abatement and Control Expenditures", chapter 8, 59-62, and "Waste Management Industry Survey", chapter 10, 67-68.

[4] There are three levels of government administration in Canada, the federal government, the provincial governments (ten provinces and two territories) and local governments (municipalities). Wherever the term provincial governments is mentioned in the text it refers to provincial and territorial governments.

data. The paper will conclude by discussing the tasks that will next be undertaken to further develop the satellite account of environmental protection expenditures.

2. THE CONCEPT OF ENVIRONMENTAL PROTECTION EXPENDITURES

Several terms have been used in the literature to refer to expenditures made for the purpose of protecting the environment. "Pollution abatement and control expenditures", "defensive expenditures" and "natural resource management expenditures" are the main concepts used but they have not always been clearly defined. *Pollution abatement and control (PAC) expenditures* are a concept used in particular by the OECD and the United States and are defined by the OECD as expenditures for "purposeful activities aimed at the prevention, reduction and elimination of pollution and nuisances that could have a harmful effect on the environment" (OECD, 1993, p.5). *Defensive expenditures* are expenditures undertaken by any economic agent with the intention of offsetting, remedying or preventing environmental degradation (Smith 1990). The United Nations in their latest handbook on environmental and economic accounting (U.N. 1993) use that concept and make a distinction between actual environmental protection activities (which include preventive protection as well as environmental restoration activities) and *environmental damage cost* (which may refer to the cost of repairing the damage as well as the social cost of the damage, such as the medical cost of treating pollution related diseases). In that regard our environmental protection expenditure account will only include the explicit expenditure made to repair the damage.

We define environmental protection expenditures as expenditures undertaken by any economic agent with the intention of preventing, reducing and remedying environmental degradation or preserving the environment (preserving natural resources, wildlife and its habitat). PAC expenditures are a component of defensive expenditures, they are only concerned with pollution prevention and abatement, not with the control of other environmental degradation[5]. Defensive expenditures are a subset of environmental protection expenditures which exclude *expenditures for natural resource conservation* (except for expenditures relating to protection of endangered species and their habitat) and *other environmental services* such as administration and education, which are other components of environmental protection expenditures.

The United Nations, the Economic Commission for Europe (ECE) and Eurostat have developed a classification of characteristic environmental activities. The OECD limits itself to PAC to produce comparative estimates of environmental expenditures among its members, as is the case for certain countries, while other countries use a broader classification of expenditures based on work by ECE and Eurostat.

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[5] PAC expenditures exclude expenditures intended for workplace protection but these are not expenditures aimed at protecting the natural environment. The OECD definition of PAC also excludes expenditures to improve production processes for commercial or technical reasons, even though they may have environmental benefits. However, the U.S. and certain other European countries include changes in processes among PAC activities.

United Nations - System of Integrated Environmental and Economic Accounting (SEEA)

The United Nations developed a conceptual framework for implementing an SNA satellite system of integrated environmental and economic accounting, which is presented in an SNA handbook on Integrated Environmental and Accounting. A draft Classification of Environmental Protection Activities (CEPA) is presented in this handbook (United nations 1993, Annex C); it is based on work done by the ECE and Eurostat to establish a standard classification of environmental protection activities and facilities and the results will be shown below. Environmental protection activities may represent main production activities, secondary activities or ancillary activities. For main production activities, the categories included in Table 1 are proposed (UN 1993, p.45):

TABLE 1
United Nations' Classification of Environmental Protection Activities
Main Production Activities

. Protection of ambient air and climate
. protection of ambient water (excluding groundwater)
. prevention, collection, transport, treatment and disposal of wastes
. protection of soil and groundwater
. noise abatement
. other environmental protection services not elsewhere specified
. sanitation and similar services

The detailed CEPA includes activities related to the protection of nature and landscape such as the protection of species and habitats and the protection against natural hazards, and research and development activities. Successive versions of the SEEA were developed according to the degree of integration of environmental data in the economic accounts system.

ECE/Eurostat Standard Statistical Classification of Environmental Protection Activities based on SERIEE

Eurostat developed the European System for the Collection of Economic Data on the Environment (SERIEE), a system of satellite accounts based on the United Nations CEPA, that will provide a standard framework for the collection and presentation of economic data on the environment. This system is composed of three elements: the central element, *a satellite account of environmental protection expenditures,* which is an application at the European level of SNA proposals for a satellite account and constitutes the first stage of SERIEE; a periphery account, *the natural resource management account* aimed at recording management and uses of natural resources including recycling activities (to be developed in the future); *"intermediate" systems* for the collection and treatment of baseline data (for the establishment of the environmental protection expenditures account), which are organised by economic sector, general government, corporations and households (Steurer, April 1994).

A standard statistical classification of characteristic activities and facilities for environmental protection has been developed under SERIEE and was revised and finalised in cooperation with the ECE, to serve as a model for all countries. We want our own statistics to be comparable internationally and for that reason we are interested in using the SERIEE classification in the development of the satellite account of environmental protection expenditures. This classification contains the nine major activities shown in Table 2. We want to develop annual estimates of expenditures under each of these headings, for all three levels of government. A more detailed classification is presented in Annex 1. Activities relating to natural resource management and use remain to be identified.

TABLE 2
The SERIEE Classification of Characteristic Environmental Protection Activities - Summary

1. protection of ambient air and climate
2. waste-water management
3. waste management
4. protection of soil and groundwater
5. noise and vibration abatement
6. protection of biodiversity and landscape (of which protection of forests)
7. protection against radiation
8. research and development
9. other environmental services (e.g. general administration, education)

Activities classified in SERIEE can be related to the different concepts presented earlier in the following way: in general the first five categories and category seven are PAC activities as well as related R&D activities. Protection of biodiversity and landscape and other environmental services are other defensive activities. Activities are essentially classified according to the environmental media and do not include those aimed at natural resource conservation (except for wildlife & habitats protection), which will be included in the natural resource management and use account. This will also the case for recycling of waste, contrary to the UN's classification which includes recycling as a distinct activity of CEPA.

3. SOURCES AND AVAILABILITY OF DATA ON PUBLIC ENVIRONMENT PROTECTION EXPENDITURES IN CANADA

In Canada, we are interested in adapting the classification of expenditures proposed by Eurostat and presented in SERIEE to the data available for each sector. With respect to the government sector, the existing data on environmental protection expenditures at Statistics Canada originate from the classification of government expenditures available in the Financial Management System (FMS), which will be compared to the SERIEE classification, the Capital and Repairs

Expenditures Survey, the 1989 PAC survey and the 1989 Local Government Waste Management Practices Survey.

3.1 FMS classification of government expenditures used at Statistics Canada

Data relating to government revenues and expenditures are produced for each level of public administration (federal, provincial and local) and by province (provincial and local governments), according to a standardised system of financial statistics, the Financial Management System (FMS). Expenditures are classified by function, that is by either the main purpose of the expenditure or the service provided. The main sources of data for federal and provincial government revenues and expenditures are the public accounts of all federal and provincial government departments, while local government data come from surveys. Local government expenditure data are based on estimates from surveys of both current and capital expenditures. These estimates are later revised using data from annual reports produced by provincial Departments of Municipal Affairs (a census of municipal expenditures in the province), in order to obtain actual figures. FMS data are produced on a fiscal year basis (April to March).

Among the eighteen categories of public expenditures (current and capital) classified under the FMS, one relates to "environment expenditures" and one relates to "resource conservation and industrial development expenditures". The SERIEE classification of activities, in contrast, does not include resource conservation (except for the preservation of wildlife and habitats). Table 3 presents a comparison of the two classifications.

3.1.1 Environmental protection

Environment expenditures, current and capital, are classified in the FMS according to the following five sub-functions:

. water purification and supply
. sewage collection and disposal
. garbage and waste collection and disposal
. pollution control
. other environmental services

Annex 2 presents a description of these sub-functions. This classification is more aggregated than the SERIEE environmental protection classification; it does not allow a distinction to be made among the media affected (air, water, soil, noise etc.), at least not at the four digit level. Among differences between the two classifications, the water purification and supply component is not included in the SERIEE classification (but it will be included in SERIEE's natural resource account). At that level of aggregation it does not provide a breakdown between environmental expenditure and expenditure for the supply of water as a product. Also, in the FMS classification recycling is an activity that is part of waste management since it is considered as an alternative to waste disposal or waste treatment, whereas in SERIEE recycling will be included in the natural resource management and use account. Research and development is another source of

difference: in the FMS it is classified according to the reason for the R&D, it is not considered separately as is the case for the SERIEE classification and indeed it does not seem practical to try to establish such a distinction. More often than not, R&D spending is included in public accounts under the relevant activity, not separately.

3.1.2 Resource conservation and industrial development

The FMS provides a breakdown of government expenditures relating to resource conservation and industrial development according to the resource (four digit level):

. agriculture
. fish and game
. forestry
. mines and oil & gas
. water power
. other resource conservation and industrial development not elsewhere specified

Annex 2 presents a more detailed description of these categories as well as other expenditures which relate to trade and to tourism and are not relevant here. From this classification it is impossible to distinguish between resource conservation and industrial development expenditures, even where data are available at the six digit level.

3.1.3 Parks

In addition to the environment and resource conservation and industrial development functions, the FMS also includes a sub-function of recreation and culture expenditures (code 19) called *parks* (19.01.02), which includes expenditures on national and regional parks. Such an expenditure is part of the ECE/Eurostat classification of environmental protection activities, under protection of landscapes and habitats (activity 6.2 in Annex 1). In the case of Canada, that sub-function is only available for provincial government expenditures for now but it should not be difficult to extract the data on federal spending from public accounts (expenditures by Parks Canada).

3.1.4 Comparison with SERIEE

Table 3 summarises the comparison of the FMS and SERIEE classifications.

TABLE 3
FMS' and SERIEE's Environmental Protection Characteristic Activities

FMS	SERIEE
Water supply	Natural Resource Account
Waste collection, disposal	Waste management except for recycling (natural resource account)
Sewage collection, disposal	Waste-water (in sewage treatment)
PAC	Protection of ambient air and climate
	Protection of ambient water
	Protection of soil and groundwater
	Noise and vibration abatement
	Protection of biodiversity & landscape (water bodies)
	Protection against radiation
Other	Other
Agriculture	Natural Resource Account
Fish & game	Protection of biodiversity & landscape (wildlife protection)
Forests	Natural Resource Account (except for forest protection - protection of biodiversity and landscape)
Other resources	Natural Resource Account
Parks	Protection of biodiversity & landscape

As can be seen most resource conservation and industrial development activities that are included in the FMS will be part of SERIEE's natural resource management account. Only expenditures on fish and game, which include expenditures for wildlife and habitats protection, and expenditures on forests (only those expenditures for forest protection from human activity) have a match in the SERIEE classification of environmental protection activities. Also, several categories of the SERIEE classification cannot be used as such for the moment to classify government expenditures in Canada, because of a lack of detail in the FMS expenditure data. We are interested in obtaining detailed information on such activities as waste management (expenditures for disposal versus expenditures for treatment, expenditures related to treatment of hazardous waste versus those devoted to treatment of non-hazardous waste, recycling expenditures etc). However it may not be necessary for Canada to obtain data at a very disaggregated level for every activity. The classification presented in Annex 1 is very detailed and all activities do not have the same importance for all sectors of the economy and for all countries. Among the nine categories of activities in SERIEE, government's commitment varies; it is responsible for most waste management activities, protection of biodiversity and landscape, research and development and administration and education but in other areas it is the business sector that is involved. In the case of waste-water management, for instance, only two of the activities listed in SERIEE involve government intervention, the installation and operation of sewerage networks and waste-water treatment. With respect to differences in countries' interests, the following list presents examples of activities that involved discussions at one of the

ECE/Eurostat work sessions in the spring (March 23-25, 1994, Geneva):

. Protection against natural hazards: this category was eliminated because it was decided that only those activities where human-caused hazards threaten natural systems should be included (such as a forest fire caused by a cigarette or a campfire; in that case the activity would be included under protection of biodiversity and landscape). Such a category is included in the United Nations' CEPA.

. Protection against radiation: this activity was included as a category but without the expenditure to build a nuclear power plant.

. Noise abatement: is an activity geared toward the protection of persons and we consider it simpler to ignore the urban environment even if humans are part of the global environment.

. We consider that snow removal should only be included if the melt water had to be treated for removal of heavy metals and other contaminants before release; otherwise it is simply an activity similar to street cleaning. Countries such as France include street cleaning as an environmental protection activity.

. Similarly, if a storm sewer system carries only rainwater, we consider that it should not be counted but if the rainwater carried is treated to remove contaminants and kill bacteria, this activity should count as an environmental protection activity. For now we only have data on total capital expenditures for storm sewers; government data on sewage disposal expenditures cover expenditures on sanitary sewers and combined sanitary-storm sewers but no expenditures on separate storm sewers.

3.1.5 Availability of the data

With regards to federal, provincial and consolidated government data, only total figures for environment expenditures and for resource conservation and development expenditures are published (available since 1965/66). Before 1986 the four digit level expenditure data were published by level of government but since then resource constraints stopped the publication of that detail. Local government expenditure data on environmental protection are available at the four digit level from 1965 to 1991 (after 1987 they are estimates based on surveys only). No distinction between capital and current expenditures is currently made at the local government level, even though the raw data originate from two distinct surveys. In the coming months we plan to obtain the capital/current expenditures breakdown by province for at least 1991 (local governments). The disaggregation of provincial government expenditures data with respect to environment and resource conservation for the fiscal years 1988/89, 1989/90 and 1990/91 will be available soon so that during the summer we will be able to obtain a breakdown of such expenditures at the four digit level of the FMS classification. With respect to federal government expenditures, resource conservation and industrial development data are available at the four digit level from 1970/71 to 1993/94.

3.1.6 Integration into the SNA

A classification of government expenditures according to the SNA conceptual framework also

exists and in theory it can be linked to the FMS classification to obtain the detail of government spending for each category of environment expenditures: current expenditures on goods and services, capital expenditures, miscellaneous expenditures on goods and services, transfers to persons, to business and to non-residents, transfers to other levels of governments (municipal governments mostly), interest on public debt and revenues from own sales of goods and services. For now a cross-tabulation between FMS and SNA classifications can be made with respect to provincial government data for 1988/89, 1989/90 and 1990/91. We are particularly interested in a breakdown of environment expenditures and resource conservation expenditures according to their current expenditure component, their capital expenditure component and the transfers to other levels of government, which can be used to produce consolidated government expenditure data.

3.2 Additional sources of data

3.2.1 Annual Capital and Repairs Expenditures Survey

Statistics Canada can provide annual estimates of capital PAC expenditures in both business and public sectors through the Capital and Repairs Expenditures Survey (CRES). Data from this survey cover intentions, revised intentions, preliminary actual expenditures and actual expenditures. A short questionnaire is most often used to collect basic information on capital and repair construction and machinery and equipment expenditures. A long questionnaire is used for the actual survey period for establishments that have previously reported large capital expenditures (i.e. expenditures of two million dollars or more for construction or machinery & equipment); it requests more detailed information and in particular allows for a distinction between PAC and non-PAC expenditures. The first part of the long questionnaire breakdowns expenditures by type of asset. Table 4 lists those assets that relate to environmental protection.

TABLE 4
Classification of Capital Assets Used in the CRES which are Relevant to Environmental Protection Activities

. PAC construction
. PAC machinery and equipment
. waste disposal facilities
. sewerage facilities: sewage treatment and disposal plants, sanitary and storm sewers, lagoons and other sewage assets;
. water treatment plants and pumping stations[6]
. sanitation equipment.

[6] Expenditures for the construction of water treatment plants and pumping stations are only one component of total expenditures on construction of water systems. However, they are the only expenditures for water systems that relate somewhat to environmental protection (cleaning of water).

The second part of the long questionnaire asks for the reasons for investment, including the percentages of total expenditures for construction and for machinery and equipment that are made for PAC purposes. With respect to local governments data come from the Local Government Capital Expenditure Survey. CRES data are not easily comparable from one year to the next because the universe covered varies from one year to the next. For instance municipal government data were introduced in 1986 and 1987 only. Capital expenditure data from the CRES are available for federal, provincial and local governments by asset type on a census basis (virtually all departments and most local governments receive the long questionnaire). The data are available from 1987 to 1991 (and 1992 in the summer).

3.2.2 PAC survey

The CRES only provides data on capital expenditures. In 1989 a PAC survey was produced at Statistics Canada; it covered both current and capital expenditures for PAC and was based on the CRES population that had declared some PAC spending.[7] It is an alternative source of data for some government expenditures for environmental protection, although incomplete (for instance local governments were not covered in that survey).

3.2.3 Survey of waste management by the municipalities

Statistics Canada also conducted a Local Government Waste Management Practices Survey for 1989/90. It sampled 1,000 municipalities of all types[8]. It was designed as a pilot survey to provide a profile of local administrations' practices in Canada with respect to collection, transport, disposal and recycling of waste (hazardous and non-hazardous waste), with a distinction between expenditures for work done by employees of the municipality and expenditures for contracting out. The survey also asked specific questions on the amount of waste that was collected, disposed of and recycled and a breakdown of quantities recycled by type of product.

We found out that total expenditure figures on waste management from the survey did not match FMS estimates of total expenditures for waste collection and disposal by local governments. Beside differences in methodology and concepts, other factors may also explain the discrepancies: the lack of a distinction between capital and current expenditures on waste management (which made certain municipalities include capital expenditures and made others exclude them); the possibility that the expenditure data may have included transfers to other municipalities; and the fact that different people answered the waste management survey questionnaire than those answering the capital and current expenditure surveys. The waste management survey would have

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[7] For more detail on the PAC survey and its results, please see Craig Gaston's article in Environmental Perspective 1993, "Pollution Abatement and Control Expenditures", Statistics Canada, cat. 11-528, chapter 8, 59-62.

[8] To prevent double-counting municipalities are classified into upper-tier and lower-tier. For the purposes of this survey, upper-tier municipalities are those encompassing one or more local government entities. Lower-tier municipalities are those within the jurisdiction of another municipality type. For more information on the survey and its results, please see Craig Gaston's article in Environmental Perspectives 1993, "Local Government Waste Management Practices Survey", Statistics Canada, cat. 11-528, chapter 11, 69-74.

required answers by experts in the area such as an engineers while the two questionnaires on capital and current expenditures would have been answered by an accountant.

4. ENVIRONMENTAL PROTECTION EXPENDITURES IN 1991 IN CANADA

Table 5 presents a summary of government expenditure data available for 1991 from the FMS and the CRES. Expenditures for resource conservation and industrial development include not only expenditures on agriculture, fish and game, forests and mines, oil and gas and other resources but also expenditures on tourism and trade, which are not related in any way to resource conservation. Annex 3 presents a summary table of environmental protection expenditure data by level of government for 1991. Work still has to be done with the available data to introduce the figures into the satellite account: the data have to be adjusted to reflect the SNA conceptual framework (e.g. adjustments to the CRES data are made for SNA purposes, a provision for capital consumption is imputed since no such provision is included in public accounts, expenditures on a fiscal year basis are transformed into expenditures on a calendar year basis; etc.).

4.1 Consolidated government expenditures

With respect to the FMS data, consolidated government expenditures on environmental protection constituted 2.4% of all government expenditures in 1991/92 at eight billion dollars (one percent of GDP), while resource conservation and development expenditures constituted 4.5% at 15 billion dollars (including expenditures for tourism and trade). From Table 5 it appears that expenditures for sewage treatment installations constituted most of government investment in environmental protection in 1991 and 8.5% of all government investment. All "environmental assets" together constituted twelve percent of all investment by government departments but only one per cent of all construction and machinery expenditures in the economy.

TABLE 5

Capital Expenditures for Environmental Protection Based on the CRES and Total Environmental Protection Expenditures Based on FMS Data for 1991.

	Federal government	Provincial governments	Local governments	All governments
CAPITAL (CRES) (million $)				
PAC construction	8.6	0.5	128.5	137.5
Waste disposal facilities	0.1	1.8	98.7	100.6
Sewerage facilities	55.0	44.8	1,032.8	1,132.7
Water treatment plants & pumping stations	0.0	7.3	227.9	235.2
PAC Machinery	8.2	13.5	22.0	43.7
Sanitation equipment	0.4	0.1	4.8	5.3
SUB-TOTAL	72.3	68.0	1,514.7	1,655.0
TOT. CAPITAL	2,938.3	4,391.7	5,960.1	13,306.9
TOTAL (FMS) (billion $)				
Environment	0.6	2.1	6.3	8.1
Resource conservation & development	6.9	9.1	0.7	15.2

Note: Resource conservation & development expenditures include expenditures for tourism and trade as well.

Source: Statistics Canada, Investment and Capital Stock Division and Public Institutions Division.

4.2 Expenditures by level of government

The federal government spent 600 million dollars on environmental protection in 1991 out of eight billion dollars for all governments, excluding resource conservation. The federal government is mostly involved in "other" environment expenditures (such as expenditures for administration of the Department of Environment, expenditures for environmental assessments, grants to environmental organisations etc.) and pollution control (e.g. expenditures for regulation and monitoring of air and water pollution, grants for R&D). Table 5 shows that the federal government's investment in environmental protection was responsible for 2.5% of its total investment in 1991.

In 1991 provincial governments spent two billion dollars on environmental protection, excluding resource conservation. From historical data and from the raw data available for 1991, it appears that provincial government administrations are mostly involved in water purification and supply (most of these expenditures are transfers to local administrations), pollution control and other environmental services. From those expenditures, 68 million dollars went to capital formation in 1991, less than two per cent of the total investment made by provincial governments.

Annex 3 presents the detail available in 1991 with respect to municipalities. That year local governments spent six billion dollars on environmental protection expenditures, excluding resource conservation. This constitutes the largest amount of spending for that purpose in the government sector. Of that spending 41% went to water purification and supply, 37% to sewerage and 20% to waste collection and disposal. More than one billion dollars went to capital formation, mostly to sewage disposal and treatment facilities (17% of local government investment in environmental protection), and the rest to water treatment plants, PAC construction and waste disposal facilities. The local government waste management practices survey showed that between 59% and 64% of waste management expenditures by local governments in Canada[9] were related to the collection of waste (59% if the work was done by contractors, 64% if done by the municipality's own employees). Disposal of waste represented about 20-21% of waste management expenditures by the largest municipalities. With regards to recycling, 73 of those municipalities declared having a recycling programme.

5. DATA GAPS AND SOLUTIONS

5.1 Data gaps in the FMS and in the CRES

5.1.1 Consolidated government expenditures

Consolidated government expenditure data currently available from the FMS do not provide the

[9]For quality reasons the results of the Local Government Waste Management Practice Survey presented here reflect only 82 lower-tier municipalities with a population greater than 50,000 in 1990.

distribution of environment and resource conservation expenditures by activity after 1983/84 and do not provide a distinction between capital and current expenditures for environmental protection. It is partly due to the lack of detail on transfers between the different levels of government. Estimates of capital expenditures by type of activity can be produced using results from the CRES, which provides data by asset type. However starting in the 1994 survey, the PAC machinery and equipment asset is going to be eliminated on the grounds that such an asset does not exist in the harmonised system of commodities used in the survey. We will have to rely on one single question on the reasons for investing, which offers PAC as a cause for investing but without a clear definition of PAC.

5.1.2 Government expenditures by level of administration

Federal government data in the FMS do not provide a breakdown of environment expenditures by activity. We know though that they are only two FMS codes being used, "PAC" and "other environmental services" expenditures.With respect to provincial and local government expenditures it is only a matter of time before the FMS data are broken down by activity (at the four digit level) and according to governments' current demand for goods and services and their demand for capital formation. It is not likely that detailed data on transfers between the three levels of governments will be available from the FMS.

Even with an available breakdown (at the four digit level) of environmental protection expenditures and a distinction between capital and current expenditures, information on activities undertaken by each level of government remains incomplete. The two FMS categories pollution control and "other" environmental services are too aggregated; they do not provide a distinction of the funds going to the protection or improvement of quality of air, water, soil or noise, and do not distinguish administrative expenditures from transfers for specific environmental goals. Also, for none of the FMS categories the importance of research and development expenditures can be assessed; they are hidden among all other environment expenditures.

5.1.3 Resource conservation and industrial development expenditures

Resource conservation and industrial development expenditures are classified according to the type of resource, and the nature of the data does not allow to distinguish between expenditures made for the resource exploitation and expenditures made for the sole purpose of resource conservation. The reason is that government data sources (ie public accounts) typically do not provide such a breakdown; expenditures are classified by government programme and each of them, typically would relate to the "sustainable development" of a particular resource such as forest or water. This is a problem confronted by several countries.

With respect to expenditures on parks, national and regional, only data on total expenditures by provincial governments for recent years will be available in the FMS, without detail on the activities involved.

5.2 Solutions

5.2.1 Capital and current expenditures

With respect to data from the CRES we should be able to obtain data on capital expenditures for PAC construction and machinery and equipment for all assets and all industries on a file from 1987 to 1992. We will work to refine data coming from the CRES (but we will lose information on PAC equipment) and attempt to conduct a more targeted PAC survey designed to obtain the data defined in SERIEE, including data on current expenditures. This will require using a better definition of PAC and extending it to include expenditures to rectify a damage made to the environment (e.g. decontamination of soil, clean up, compensations etc.). However it is likely that the new PAC survey will cover only the business sector.

5.2.2 Analysis of public accounts and annual reports of departments

Since the FMS classification originates from the public accounts framework it will be necessary to analyse in depth the content of the federal and provincial governments' public accounts in order to obtain detailed information on the nature of environment expenditures reported in the FMS, specific data on natural resource conservation expenditures (as opposed to expenditures for resource conservation and exploitation), and a breakdown of that data according to current expenditures, capital expenditures and transfers between levels of government. Only a few departments are involved in activities that relate to environmental protection at the federal and provincial government levels, Environment Canada, Natural Resources Canada, the Department of Fisheries and Oceans, Agriculture Canada, Parks Canada, and their provincial counterparts. However the public accounts use a standard classification of expenditures that has not been developed for the purpose of showing detailed expenditures on environmental protection, therefore an analysis of annual budgets reports from the various federal and provincial departments of interest will also have to be done. The analysis of those documents will likely be accompanied by discussions with officials from the departments involved in order to obtain a good understanding of the data produced in the public accounts and in the annual reports and to complete the information. Those contacts will be particularly needed for the purpose of gathering data on resource conservation expenditures since public accounts and budget reports do not normally provide a distinction between conservation and exploitation activities with respect to natural resource management expenditures. Talks with officials will also be necessary to obtain data on R&D expenditures for each major activity presented in the SERIEE classification. With respect to local government expenditures, some additional information may be available from annual reports produced by the Department of Municipal Affairs of each province.

5.2.3 New survey of local governments' waste management practices

Another survey on waste management practices by local governments may be done; a new one has just been produced but it does not include information on expenditures, only data on quantities. A new waste management survey for local governments that would include expenditures as well as quantities could be designed in order to provide a distinction between

capital and current expenditures, a distinction between the different methods of waste disposal, and information on all aspects of recycling (if a municipality is responsible for the treatment of waste), Work would then have to be done to reconcile the data with FMS expenditure data on waste management by local governments. Such a survey does not need to be produced every year; it could be produced every five years for instance while in the mean time data from existing sources would be used.

5.2.4 Revisions to the Standard Industrial Classification

There are flaws in Canada's Standard Industrial Classification with respect to the coverage of industries involved in environmental protection activities. Many of the environmentally oriented goods and services produced in the economy are not reflected in the classification. The waste management industry for instance does not have an explicit SIC. The 1997 SIC revision will refine certain categories to reflect the environmental nature of certain industries such as the waste management industry and isolate environmental goods and services provided, through the commodity dimension, where possible. With respect to the government sector, the revision will isolate where possible environmental services provided by public organisations, such as the operation of municipal landfill sites, water and sewage services, forestry protection, parks management, and monitoring of air and water quality.

6. INTERNATIONAL COMPARISONS

A look at the practical experience of other countries in producing and using environmental protection expenditure data shows the extent to which they have applied the SERIEE classification to their own government expenditure data compared to Canada. It also provides a comparison of Canada's and other countries' involvement in collecting data on environmental protection expenditures. A comparative summary is presented in Annex 4 for the United States, Austria, the Netherlands, Australia and other countries such as France, Germany, Sweden, Japan and Danemark. Estimates of public PAC expenditures in OECD countries as a percentage of GDP are presented in an OECD study (OECD 1993) and are summarised in Table 6.

6.1 Review of other countries' experience

There has been little practical experience so far in applying SERIEE. With regard to government expenditures countries have different classifications and it was found that it is often impossible to distribute expenditures according to the SERIEE classification because the more aggregated data from public accounts do not allow one to distinguish between environmental protection activities and those that have other purposes. Canada is to some extent in that situation. However existing sources of data on public administrations (financial statistics, budget data, specific surveys and estimations) are important since they provide information on existing environmental protection expenditures and their magnitude (Blazejczak, Edler and Charlot 1994).

The countries presented in Annex 4 have done some work in gathering specific data on

environmental protection expenditures. For instance, contrary to Canadian practice, the *U.S.* has systematically produced data on PAC expenditures by sector and by environmental media since 1972, published on a regular basis in the Survey of Current Business. With respect to public sector data, statistics are developed from surveys of government finances, of construction spending by governments and surveys of federal funding for PAC, and from information on state and local governments spending for regulation and monitoring. The U.S. do not apply the SERIEE classification; public sector data mainly cover expenditures for sewerage, waste management and regulation and monitoring.

Austria has started applying the SERIEE classification of environmental protection activities to expenditure data for 1990 and 1991 after first having produced expenditure estimates based on the OECD model. The application of SERIEE involved complete new work in developing expenditure data for the public sector. Environmental expenditures are published according to most SERIEE classification headings, protection of ambient air, of ambient water, waste management, noise abatement, protection of landscape, soil and nature and general environmental protection. The *Netherlands* Central Statistical Office has a large environmental protection survey programme; the majority of characteristic activities are included in public sector surveys and most of SERIEE's nine headings are used and can be disaggregated, except for certain components of waste-water management and soil and groundwater protection.

The Australian Bureau of Statistics recently produced a study on the cost of environmental protection in *Australia* incurred by manufacturing and mining industries and by the government for 1990-91 (ABS 1994), based on the OECD framework for the collection of data on PAC expenditures. The ABS study, however, goes somewhat beyond a PAC framework by examining the possibilities of presenting estimates for non-PAC environmental expenditures which are included in total expenditures on conservation and natural resource management. Data are available for government outlays on national parks and wildlife. The cost of environmental protection in the public sector is estimated by level of government; expenditures are classified according to the Government Purpose Classification (consistent with the United Nations Classification of the Functions of Government) in order to include activities such as water supply, sanitation, waste and national parks and wildlife. This classification is more aggregated than SERIEE's and includes activities such as water supply, like Canada's FMS classification, which are excluded from SERIEE's classification of environmental protection activities.

In *France* public sector expenditure data on environmental protection are estimates based on public accounts analysis and existing statistics, and classified according to a standard government classification. In *Germany*, public environmental expenditures published by the Federal Statistical office are general estimates published at the national level only. The federal government and a few Lander publish a summary of budget expenditures that concern environmental protection according to their own definitions. Public administration data are calculated for all administrations as a whole. In *Sweden* efforts have been concentrated in recent years on local government expenditures; a survey of expenditures by municipalities has been produced for 1991. In *Japan* public sector surveys exist since 1967 for the central government and since 1971 for local governments and cover both current and capital expenditures. For these four countries

activities are not specifically broken down according to the SERIEE model.

6.2 International comparisons of public PAC expenditures

The State of the Environment Division of OECD has been publishing statistics on pollution abatement and control expenditures (PAC) for more than ten years, based on surveys undertaken in most OECD countries. The 1992 OECD survey ensures consistency with work developed by Eurostat and the UN-ECE (OECD 1993). The OECD published tables comparing the importance of PAC expenditures for all its members. Table 6 presents a comparison of total PAC expenditures in the public sector as a percentage of GDP from 1985 to 1990.

The figures for Canada are derived from FMS environment expenditure data[10]. Canada's public expenditures on PAC (according to OECD's definition) represented 0.7% of GDP between 1985 and 1988 and almost 1% of GDP in 1990; that share is comparable to those of other OECD countries. The percentages reflect government's environment expenditures of four billion dollars (Canadian dollars) a year between 1985 and 1987, 6.5 billion dollars in 1989 (fiscal year) and 7.6 billion dollars in 1990 (fiscal year) according to FMS data. OECD figures have to be interpreted with caution since they are mostly estimates based on a variety of data sources which make international comparisons difficult. Also certain years are not comparable because of changes in methodology or source used. The figures are simply shown to provide an order of magnitude. These inadequacies reflect the urgent need for better information about spending for environmental purposes for all countries.

[10] However only half of the expenditure on water purification and supply was used in the OECD estimates in order to remove the supply component, which is not considered a PAC activity.

TABLE 6
PAC Expenditures in the Public Sector as a Percentage of GDP from 1985 to 1990

	1985	1987	1988	1989	1990
Canada	0.7	0.7	0.7	0.8	0.9
USA	0.6	0.6	0.5	0.6	0.6
Japan	0.9	1.0	1.0	1.0	1.0
Austria	1.0	1.0	1.0	-	-
Denmark	0.7	0.8	0.9	0.9	1.0
France	0.6	0.7	0.7	0.7	0.5
W. Germany	0.7	0.8	0.8	0.8	0.8
Italy	-	-	0.2	0.2	-
Netherlands	1.0	0.9	-	0.9	-
Portugal	-	-	0.5	0.4	-
Spain	-	0.5	0.5	0.6	0.6
Sweden	-	0.7	-	-	-
Switzerland	0.7	-	0.7	0.8	-
United Kingdom	0.7	-	-	-	0.4

Note: Figures for Canada are Secretariat estimates based on Statistics Canada's time series on government expenditures published in Human Activity and the Environment 1991, in Table 3.2.3.2 (p. 101-102), "Government Expenditure on Environment and Resources, 1984-1990".
Source: OECD (1993)

7. CONCLUSIONS

7.1 Development of a satellite account of government expenditures on environmental protection

In this era of intense scrutiny of government expenditure, it is especially important that the functional structure of government spending be well understood, not just for Canada as a whole but also for all three levels of government. It is also necessary that work done in that regard be internationally comparable. SERIEE is a valuable step forward since it proposes not only a standard classification of environmental protection activities and facilities, but also presents a

model for the development of a satellite account of environmental protection expenditures. Work remains to be done though in SERIEE on the matter of developing a natural resource management and use account.

Results derived for this paper, while incomplete, tend to show that though government spending on environmental protection represents a small portion of total government budgets in Canada, it is significant (eight billion dollars in the fiscal year of 1991, excluding resource conservation) and is undertaken by all three levels of government with local governments contributing the most. Therefore it deserves to be investigated further. By the end of the summer we should be able to obtain data on provincial and local government demand for environmental protection activities from the FMS, for 1991 at least, by type of activity, as well as data on capital formation by activity.

The next steps will be to analyse public accounts and annual reports of departments and results from discussions with officials, and to use the data obtained in conjunction with the FMS data to produce a table of government expenditures broken down by environmental protection activity according to the SERIEE classification, modified to include resource conservation activities as well. For each activity corresponding to the rows of the table, expenditure data will be distributed by level of government, with a distinction between current and capital expenditures and transfers. We will start with federal government expenditures since the sources of data are more limited and produce such a table for a benchmark year, probably 1991. Producing data for earlier years is not our immediate priority; it is rather a long term goal. Once the federal government table is produced, we will use the methodology to extend work to provincial and local government expenditures. A new survey on waste management practices by local governments may be conducted that would provide disaggregated data on waste management expenditures by municipalities.

In addition, we may decide to establish a distinction in the table between PAC expenditures, other defensive expenditures, resource conservation expenditures and other environmental protection expenditures such as general administration and education. We are interested in a detailed breakdown of environmental protection activities however, as was pointed out earlier, we do not feel that all SERIEE's main activities need to be disaggregated at the same level.

7.2 Other satellite accounts of environmental protection expenditures

In parallel, we will be working on developing environmental protection expenditure accounts for the business and household sectors, using the SERIEE classification as a model. With respect to the business sector, this will involve an analysis of the data from the CRES by industry and of the data from the 1989 PAC survey. We are working on a new PAC survey that would include a broader definition of PAC expenditures (e.g. include expenditures for the cleaning and restoration of the environment).We will also look at alternative sources of data.

We are also planning to work on defining the environment management industry and surveying the main players in that industry and the goods and services produced, including R&D activities.

The Canadian government has expressed interest in that regard especially in line with trade issues and job creation opportunities. We will cooperate with the Standards Division in defining such an industry. A survey of the waste management industry was produced for 1989 and it would be useful to produce a new one. In addition we are also exploring ways to obtain data on exports and imports of environmentally friendly products and technologies and environmental services.

With respect to the household sector we will examine the contents of Statistics Canada's Family Expenditures Survey and investigate possibilities of adding questions that are more pertinent to environmental protection activities.

ANNEX 1

ECE/EUROSTAT CLASSIFICATION OF CHARACTERISTIC ENVIRONMENTAL PROTECTION ACTIVITIES

1. Protection of ambient air and climate

1.1 Prevention of pollution through in-process modifications
- 1.1.1 for the protection of ambient air
- 1.1.2 for the protection of climate and ozone layer

1.2 Treatment of exhaust gases and ventilation air
- 1.2.1 for the protection of ambient air
- 1.2.2 for the protection of climate and ozone layer

1.3 Measurement, control, laboratories and the like
1.4 Other activities

2. Waste-water management

2.1 Prevention of water pollution through in-process modifications
2.2 Sewerage networks
2.3 Waste-water treatment
2.4 Treatment of cooling water
2.5 Measurement, control, laboratories and the like
2.6 Other activities

3. Waste management

3.1 Prevention of waste production through in-process modifications
3.2 Collection and transport of waste
3.3 Treatment and disposal of hazardous waste
- 3.3.1 thermal treatment
- 3.3.2 landfill
- 3.3.3 other treatment and disposal

3.4 Treatment and disposal of non-hazardous waste
- 3.4.1 incineration
- 3.4.2 landfill
- 3.4.3 other treatment and disposal

3.5 Measurement, control, laboratories and the like
3.6 Other activities

4. Protection of soil and groundwater

4.1 Prevention of pollutant infiltrations
4.2 Decontamination of soils

4.3 Measurement, control, laboratories and the like
4.4 Other activities

5. Noise and vibration abatement

5.1 Noise and vibration from road and rail traffic
    5.1.1 preventive in-process modifications at the source
    5.1.2 construction of anti noise/vibration facilities
5.2 Air traffic noise
    5.2.1 preventive in-process modifications at the source
    5.2.2 construction of anti noise/vibration facilities
5.3 Industrial process noise and vibration
5.4 Measurement, control, laboratories and the like
5.5 Other activities

6. Protection of biodiversity and landscape

6.1 Protection of species
6.2 Protection of landscapes and habitats
    of which: 6.2.1 protection of forest
6.3 Rehabilitation of species population and landscapes
6.4 Restoration and cleaning of water bodies
6.5 Measurement, control, laboratories and the like
6.6 Other activities

7. Protection against radiation (excluding nuclear power stations and military installations)

7.1 Protection of ambient media
7.2 Measurement, control, laboratories and the like
7.3 Other activities

8. Research and development

8.1 Protection of ambient air and climate
    8.1.1 for the protection of ambient air
    8.1.2 for the protection of atmosphere and climate
8.2 Protection of ambient water
8.3 Waste
8.4 Protection of soil and groundwater
8.5 Abatement of noise and vibration
8.6 Protection of species and habitats
8.7 Protection against radiation
8.8 Other research and development on the environment

9. Other environmental protection activities

9.1 General administration of the environment
9.2 Education, training and information
9.3 Activities leading to indivisible expenditure
9.4 Activities not elsewhere specified

Note: Expenditures relating to the conservation of water and other energy resources, such as forests and oil, and expenditures relating to recycling activities will be integrated in a natural resource management and use account. Activities for protection against natural hazards (dune stabilisation, flood protection, fire protection, protection against erosion, avalanches) were excluded from the classification because it was thought that they were not related to environmental protection but to personal protection.

Source: A. Steurer, "General accounting framework of the Environmental Protection Expenditure Account of the SERIEE manual, Chapters 1 & 2", Appendix 1, Working Group on "Statistics of the Environment", Joint Eurostat/EFTA Group, Meeting of 25 & 26 April 1994.

ANNEX 2

FMS CLASSIFICATION OF ENVIRONMENT AND RESOURCE CONSERVATION & INDUSTRIAL DEVELOPMENT EXPENDITURES

18 Environment

A function of government with the common aim of ensuring the most favourable environment for people and of minimising the negative effects of modern living on that environment.

18.01 Water purification and supply

18.01.01 Administration: water resources administration;
18.01.02 Supply and distribution: program costs, direct services and contributions for water supply systems (purification, distribution and pollution control);
18.01.09 Other: research and grants to research, monitoring of water quality and water quality control;

18.02 Sewage collection and disposal

Expenditures on construction, operation and maintenance of sewage removal and treatment facilities, including expenditures on sanitary sewers and combined sanitary-storm sewers (excluding storm sewers which are classified under "transportation and communication - roads"), and on inspection, cleaning and flushing of sewers, grants in aid or research relating to sewage matters.

18.03 Garbage and waste collection and disposal

18.03.01 Administration of waste collection and disposal programs
18.03.02 Collection
18.03.03 Disposal: solid waste and hazardous waste management, recycling, waste disposal sites, landfill sites, incineration, clean-up of chemical waste sites etc.
18.03.09 Other: research

18.04 Pollution control

Expenditures on the prevention of pollution and on reducing or limiting its detrimental effects on the environment, that cannot be allocated to a more specific function, such as expenditures for air pollution control, clean-up, pesticides control, acid rain assessments, noise abatement, environmental investigations, research and laboratory services etc.

18.09 Other environmental services not elsewhere specified

Expenditures for services such as information dissemination, environmental control council, environmental research, review and studies, administration of the department of the environment, environmental advisory boards, subsidies and grants to municipalities, industries and organisations

concerned with environmental matters.

17. Resource conservation and industrial development

17.01 Agriculture
17.01.01 research
17.01.02 stabilization of farm prices and incomes
17.01.09 other agriculture: including soil and land conservation, control of soil erosion, drainage and flood mitigation systems as well as a range of services that have nothing to do with environment protection of conservation of soil (production services, livestock services etc.)

17.02 Fish and game
17.02.01 research
17.02.09 other including not only fish and wildlife management, protection and control but aquaculture development, fish farming etc.

17.03 Forests
17.03.01 research
17.03.09 other including pest and disease control, fore fighting, reforestation, forest exploitation, construction of access roads etc.

17.04 Mines and oil and gas
17.04.01 Mines: research (17.04.01.01), other (17.04.01.09) including conservation as well as exploitation.
17.04.02 Oil and gas: research, other including conservation and renewable energy development as well as development of the reserve...

17.07 Water power
17.07.01 research
17.07.09 other including construction of dams, flood damage reduction, hydroelectric power etc.

17.09 Other resource conservation and industrial development
It includes crown or public lands management, energy conservation, conservation authorities and energy research and development etc.

Categories 17.05 and 17.06, tourism and trade and industry, are not included here because they do not relate to environment protection.

19.01.02 Parks

Expenditures included here relate to the following programmes: parks planning and development, parks commissions, parks design and implementation, visitors services, provincial parks operations, and parks construction and redevelopment.

ANNEX 3

GOVERNMENT EXPENDITURES FOR ENVIRONMENTAL PROTECTION, 1991, BY LEVEL OF GOVERNMENT

FEDERAL GOVERNMENT EXPENDITURES

	(million $)
CAPITAL EXPENDITURES (CRES)	2,938.3
PAC construction	8.6
Waste disposal facilities	0.1
Sewage treatment & disposal	55.0
Water treatment plants & pumping stations	0.0
PAC machinery & equipment	8.2
Sanitation equipment	0.4
SUB-TOTAL	72.3
ENVIRONMENT EXPENDITURES (FMS)	598.2
RESOURCE CONSERVATION & INDUSTRIAL DEVELOPMENT (FMS)	6,917.2
Agriculture	3,632.7
Fish and game	430.6
Forests	229.8
Mines	83.4
Oil & Gas	355.6
Water power	9.2
Other	630.2

PROVINCIAL GOVERNMENT EXPENDITURES

The detail of activities according to the FMS classification are not available yet. Please refer to Table 5 for the data available. Also, total environment expenditures and resource conservation and development expenditures are available by province.

LOCAL GOVERNMENT EXPENDITURES

CAPITAL EXPENDITURES (CRES)	5,960.1
PAC construction	128.5
Waste disposal facilities	98.7
Sewage treatment & disposal	1,032.8
Water treatment plants & pumping stations	227.9
PAC machinery & equipment	22.0
Sanitation equipment	4.8
SUB-TOTAL	1,514.7
ENVIRONMENT EXPENDITURES (FMS)	6,306.1
Water purification & supply	2,577.0
Sewage collection & disposal	2,321.8
Garbage & waste collection & disposal	1,287.3
Other environment	119.9
RESOURCE CONSERVATION & INDUSTRIAL DEVELOPMENT (FMS)	692.7
Agriculture	185.5

Note: Data for environment expenditures and resource conservation and development expenditures are on a fiscal year basis. Total resource conservation and development expenditures include expenditures for tourism and trade as well.

Source: Investment and Capital Stock Division
Public Institutions Division , Statistics Canada

ANNEX 4

CONCEPTS AND METHODS OF DATA COLLECTION IN THE PUBLIC SECTOR - REVIEW OF OTHER COUNTRIES EXPERIENCE

1) UNITED STATES

Contrary to Canadian practice, the U.S. have been systematically collecting data on *PAC expenditures* since 1972. Statistics are developed by the Bureau of Economic Analysis and data on PAC expenditures by manufacturing establishments are published by the Bureau of Census. PAC statistics are published regularly in the Survey of Current Business (Rutledge and Leonard 1992). The June 1992 issue presented revised estimates from 1972 to 1990.

The U.S. define PAC expenditures as "expenditures for goods and services used by U.S. residents to produce cleaner air and water and to manage solid waste" (Rutledge and Leonard, 1992, p.25). They refer to most PAC activities (ie resulting from rules and regulations "restricting the release of pollutants into common property media such as air and water"), excluding those that do not use productive resources or which use productive resources that are non-market activities. Characteristic activities are classified according to the following environmental media:

. air (mobile sources and stationary sources of pollutants),
. water (point sources and non point sources),
. solid waste: includes collection, disposal of solid waste (industrial waste and other waste, which includes government and household spending to reduce waste) and changes in production process to generate less solid waste,
. other and unallocated: other spending includes abatement and control of noise, radiation and pesticide pollution, while unallocated spending includes business expenditures not assigned to a media.

The Survey of Current Business presents total PAC spending estimates by sector (government, business and households), and also provides a breakdown of government and business expenditures separately by media, in current and constant dollars. Government expenditures for PAC in the US include government enterprise expenditures (in Canada they are included in the business sector expenditures).

The US use a variety of data sources to produce PAC estimates on a regular basis. For instance, about 60% PAC expenditures estimates come from data originating from four key surveys conducted by the Bureau of Census (including the Pollution Abatement Costs and Expenditures Survey for manufacturing establishments) and other surveys by the Bureau of Economic Analysis. With respect to public sector data, the Bureau of Census conducts surveys of government finances to obtain information on government spending to operate sewer systems and for solid waste disposal, and surveys of the value of new construction put in place which cover government spending for the construction of sewer systems. In addition the Bureau of Economic Analysis collects data on Federal funding for PAC and information from the Environmental

Protection Agency (EPA) regional offices on State and local government spending for regulation and monitoring.

Government data in the Survey of Current Business are published by level of government and by type of media (air, water, solid waste, other which includes spending for abatement and control of noise, radiation and pesticide pollution). Expenditures by government for regulation and monitoring toward reducing pollutant emissions are also published.

2) AUSTRIA

Environmental expenditures in Austria are published according to six categories that are not significantly different from SERIEE categories: Protection of ambient air, of ambient water, waste management, noise abatement, protection of landscape, soil and nature, general environmental protection. Public environmental expenditures are disaggregated by four levels of government. The principal source of data is an analysis of public sector accounts[11].

OECD study (*PAC expenditures*)

In Austria, data on environmental expenditures have been collected since the early 1980's by the Central Statistical Office. "PAC expenditure is defined as expenditure directed toward avoiding, abating or controlling emissions and waste disposal into the environment" (OECD 1993). PAC activities covered by the OECD study only include direct PAC, planning, monitoring and regulatory activities, even though data on expenditures for re-cultivation, R&D and recycling are available. Environmental media include air, waste-water collection and treatment, waste disposal and noise (for electrical utilities only total expenditure figures are available). Public sector expenditures cover all levels of government, including special institutions such as "ecofunds".

Applying SERIEE (*environmental protection expenditures*)

In 1993, the Austrian Statistical Office actually estimated environmental protection expenditures applying the SERIEE system for 1990 and 1991 (Steurer 1994). In fact 90% of those expenditures have been estimated because of current lack of data. Most of the work done by applying SERIEE had to do with the analysis of the public sector since an industry survey already exists. An analysis of the budgets of central and local governments and large cities was made, but a survey of environmental protection expenditures (EPE) in the public sector was required since 80% of public EPE are undertaken by communities. The main activity principle had to be used several times to classify economic transactions with respect to a particular environmental activity. Steurer's paper summarises the theoretical and practical problems that had to be solved, and the solutions chosen. They concerned the following:

. evaluating low interest loans (cash value method chosen);
. evaluating interest expenditures of financial corporations like funds whose main purpose is to

[11] See Blazejczak, Edler and Charlot (1994) for more detail.

finance EPE such as ecofunds (inclusion of such an expenditure);
. how to deal with transfers if data concerning the beneficiary are missing (capital transfers are considered as investment while current transfers are considered as current expenditures by the beneficiary);
. classification problems with "protection of landscape", "protection of ecological heritage" and "street cleaning"; expenditures for "protection against natural hazards" were excluded.

The Central Statistical Office's agenda for EPE includes the use of a proposed questionnaire on waste, a survey concerning joint associations of communities, an in-depth analysis of the NAEC rev.1 class 90, and an analysis of those items included in Steurer's calculation scheme of EPE accounts used in Austria (especially items regarding households), in order to produce databases allowing to estimate respective EPE.

3) NETHERLANDS

The Netherlands Central Statistical Office has a large environmental protection survey programme; it has been conducting surveys on environmental expenditures for a number of years. In 1979 it conducted a special survey as a basis for the annual investment surveys that have been carried out since then. Survey results are updated for current PAC expenditures by estimation. PAC activity is defined as the reduction of emissions and waste flows arising from production and consumption activities. *PAC expenditures* are expenditures that would not have been made in the absence of environmental considerations.

The CBS survey of costs and financing of environmental control includes almost all activities undertaken with the intent of protecting, restoring or improving the state of environment (direct PAC, regulation and monitoring, co-ordination of PAC activities, R&D on production and consumption technologies doing less harm to the environment, expenditures for end-of-pipe technologies and in-process new technologies, the proportion of the purchase value of environmentally friendly capital goods that exceeds the alternative value of normal equipment). Environmental media included comprise waste, surface water, groundwater, soil, air and noise and other media such as landscape. The survey excludes measures whose costs are recovered by revenue from byproducts or savings on personnel, raw material or natural resources. Costs of own environmental activities, transfers paid and received and net costs are available by sector (enterprises, governments, institutions, households) and for traffic and other unallocated activities. Expenditure data are available both according to the abater principle (sector undertaking the activity) and the financing principle (sector financing the activity). They are published by the Netherlands Central Bureau of Statistics in Environmental Statistics of the Netherlands (Netherlands CSO 1993).

Government expenditures on environmental protection include expenditures made by central, provincial and municipal governments, including water boards and inter-municipal corporations. The Central Statistical Office surveys governments regarding waste management. Municipalities are responsible for waste disposal from households and small businesses; the cost is partly passed on to waste generators by means of the refuse collection rate. Municipalities also obtain revenues

from the sale of energy and incineration residues. Government policy with respect to air pollution abatement is financed by levies imposed on fuels. With respect to soil pollution abatement, clean-up operations are under the responsibility of the government, mainly the Central Government. Surface water pollution abatement is the responsibility of the Central Government, and of provincial governments and municipalities responsible for public sewage treatment (costs are recovered by enterprises and households who are responsible for the discharge, via the Surface Waters Levy & Sewerage Tax).

4) AUSTRALIA

The Australian Bureau of Statistics recently produced a study on the cost of environmental protection in Australia incurred by manufacturing and mining industries and by the government for 1990-91 (ABS 1994), based on the OECD framework for the collection of data on PAC expenditures. In the study, *PAC expenditures* estimates, like the OECD study, include only expenditures on end-of-pipe (retrofit) facilities and equipment, at the exclusion of expenditures for production process improvements that may have environmental benefits, or costs of change in production quality which have more environmentally benign impacts. The ABS study, however, goes beyond PAC framework by looking at the possibilities of estimating *non-PAC environmental expenditures* (not resulting in reduction of pollution levels in the year of expenditures, such as R&D, land care, regulation ...). In the case of the public sector non-PAC environmental expenditure data are available for government outlays on national parks and wildlife only; other such expenditures are hidden under total expenditures on conservation and natural resource management which include expenditures for resource exploitation as well.

The cost of environmental protection in the public sector is estimated by level of government using unpublished public sector accounts data (gross current expenditures data from ABS Public Finance Statistics and gross fixed capital expenditures data from Government Finance Statistics). Expenditures are classified according to the Government Purpose Classification (consistent with the United Nations Classification of the Functions of Government) in the following way:

. water supply (half of all outlays taken into account in order to exclude supply of drinking water);
. sanitation and protection of the environment
- household garbage (collection & disposal)
- other sanitation (disposal of industrial and radioactive waste, cleaning of streets and gutters)
- sewerage (collection, treatment and disposal)
- urban stormwater drainage
- protection of environment n.e.c.;
. national parks and wildlife (administration, regulation, support & operation)

In later editions of the publication the Bureau of Statistics is going to improve collection of non-PAC expenditures through the public sector to include such considerations as the following (from Graeme Oakley's letter to ECE, February 1994):

.climate change and environmental liaison costs (e.g. greenhouse research etc.)
. environmental planning (e.g. implementation of environment policies and research etc.)
. conservation activities (e.g. biodiversity research etc.)
. natural resources management (e.g. conservation programmes, land use etc.)
. environment protection not covered by PAC framework (e.g. measuring and monitoring, environment databases, pollution inventories)
. nature conservation activities and programmes (National Parks operating costs, public education and information, endangered species programmes etc.)
. environmental administration

It appears that the Australian Bureau of Statistics has the same objectives as Statistics Canada concerning the establishment of a satellite account of environmental expenditures and the inclusion of nature conservation activities.

5) OTHER COUNTRIES

France

According to the OECD study, PAC expenditure data are available since 1979 in France as part of a regular analysis of economic aspects of the environment (data published in the "Données économiques de l'environnement" from the Ministry of Environment). PAC data cover pollution abatement, regulation and monitoring and R&D. Characteristic activities include waste-water collection and treatment, abatement of polluting accidents such as oil spills, collection and treatment of waste, reduction of noise and abatement of air pollution.

Public sector expenditures include all levels of government and the data come from public accounts and are classified according to the standard classification used by public administrations. For each category of this classification the environmental component is estimated. Current expenditures of the public sector are estimated from data coming from a baseline study; updated figures are produced through observable variables such as the wage index for public servants, or information about the state of PAC equipment. Since 1992 PAC activities include street cleaning, which modifies public expenditures for waste. Public expenditures on air PAC are not directly available because they are included under "general improvement and protection of the natural environment and the national heritage" (the OECD survey excludes such spending). The abater principle is generally followed but for some years evaluations of financial flows were made.

Germany

PAC investment expenditures are defined not only as expenditures for capital goods to protect against environmental damage and nuisance arising from the production process, but also as capital goods expenditures made in order to produce more environmentally friendly products. In the latter case, only the part of the expenditure which is incurred in response to environmental regulation is included (OECD 1993). Such an inclusion is not common to a lot of countries. German expenditure statistics cover direct PAC expenditures, monitoring and control and R&D.

Water, air, treatment and removal of waste and protection against noise are the covered media. Current and investment expenditures of the public sector are based on estimations based on the federal government's budget and the budgets of a few Lander and cover all levels of government. In addition, the Federal Statistical Office publishes receipts of the public sector from environmental services, as well as the volume of private sector capital expenditures that qualified for investment tax incentives. A research project financed by the Federal Environment Office allowed the estimation of government spending on environment for the 1971-1981 period, using government budgets and financial statistics. Similar estimations are currently made for 1989.

Sweden

In Sweden, data on PAC expenditures in the industry are available from a survey on environmental investments and costs in the Swedish industry, which was produced in 1981 (as a pilot survey), in 1985-86 and in 1988-89. A new survey was also produced in 1992 for 1991 PAC expenditures. According to the OECD study, some statistics are also available for the central government and the results of a 1991 survey of municipalities should have been made available in 1993. The OECD data for the public sector are based on estimates of expenditures of central, regional and local governments. Investment expenditure statistics were not always available so capital costs were used instead for that sector. With respect to the public sector, Sweden has concentrated its efforts on the calculation of local government expenditures and produced its first survey (a postal survey) on "Environment Protection Costs in Municipalities". The data in that survey include investment and operating expenditures and revenues and relate to waste-water treatment, solid waste management, energy production carried out municipal enterprises and general administration. Also, a report on a survey of federal government expenditures in environment protection was due in the spring (Blazejczak et al. 1994).

Japan

In Japan there are several continuing surveys on PAC expenditures, which are defined as expenditures for those activities directly contributing to pollution control with respect to air, water, soil, solid waste, noise and vibrations, and odours. Public sector surveys are conducted annually since 1967 for the central government and since 1971 for local governments, and in both cases cover investment and current expenditures (need for adjustment by OECD to avoid double counting).

Denmark collects PAC expenditures statistics through its National Agency of Environmental Protection, for the public sector and utilities. **Switzerland**'s Ministry of Finance produces data on PAC expenditures for the public sector, based on public finance statistics that are available since 1970[12].

[12] for more detail see Blazejczak, Edler and Charlot (1994).

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The National Accounts and Environment Division (NAED) has a series of discussion papers on topics in environmental statistics which users can obtain without charge. A list of the papers currently available is presented below. For copies, contact the NAED client services representative at 613-951-3640 or write to Statistics Canada, 21st Floor, R.H. Coats Building, Tunney's Pasture, Ottawa, Ontario, K1A 0T6.

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