Statistics Netherlands

Division of Economics, Companies and National accounts

National accounts department

P.O.Box 24500

2490 HA Den Haag

The Netherlands

Adaptation and mitigation expenditures due to climate change of the general government 2007-2010

Geloof, E.W. van and Kruik, M.J. de

Remarks:
The views expressed in this paper are those of the authors and do not necessarily reflect the policies of Statistics Netherlands.

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ADAPTATION AND MITIGATION EXPENDITURES DUE TO CLIMATE CHANGE OF THE GENERAL GOVERNMENT 2007-2010

Summary:

Keywords:

1. Introduction

Climate change is high on the political agenda at all levels. In the scientific world there is general consensus that economic and social pressures are contributing to climate change. Accelerating emissions of carbon dioxide, methane, and other greenhouse gases since the beginning of the 20th century have increased the average global temperature by about 0.8°C and altered global precipitation patterns (IPCC, 2007). There are also indications that since 1950 weather extremes are changing on a global level (IPCC 2011). Accordingly, cold periods are occurring less, whereas heat waves, droughts and heavy rains are occurring more often. Climate change is already affecting economic activities throughout the world. In the future, the impacts on society, the economy and the environment will only increase. So there is a high demand for good statistics that can support the measurement and analysis of the drivers, the social and economic consequences of climate change and the related mitigation and adaptation measures (UNEP, 2008; Parry et al., 2009).

The system of Integrated Environmental and Economic Accounting (SEEA) has been developed to integrate environmental and economic information in one common framework (UN et al., 2012). SEEA has been adopted as an international statistical standard by the UN Statistical commission in the beginning of 2012. Environmental accounting can be used to monitor and analyse a wide range of environmental issues, including climate change. In the report "SEEA as a framework for assessing policy responses to climate change" (Schenau, 2010) the parts of SEEA were identified that contain relevant information with regard to climate change. The report showed that the environmental accounting framework can serve as a basis to bring together the different aspects of climate change. The set of different accounts which were accordingly identified, are tentatively named "climate change accounts".

One of the recommendations of the report was to develop accounts on mitigation and adaptation expenditures. Data on mitigation and adaptation expenditures related to climate change are lacking at the moment both in basic statistics (i.e. emission inventories, energy balances, business statistics etc.) and in the environmental accounts. However information on this subject can be very useful for

researchers and policymakers. Interest in harmonized and standardized statistics on the costs of adaptation and mitigation measures comes from the national and certainly from the international community. Countries are required to report government expenditures for adaptation to climate change as part of the country level reporting to the United Nations Framework Convention on Climate Change (UNFCCC) in compliance with the Kyoto Protocol. A couple of studies exist with estimates on the costs of climate change adaptation. However, more quantified information on the costs and benefits of adaptation based on a more harmonised methodology is needed (UNFCCC, 2007 and 2010; Commission of the European Communities, 2009).

This report is the result of an assessment done in the Netherlands to determine mitigation and adaptation expenditures of the government related to climate change. Chapter 2 delineates the research question of this study and contains definitions of adaptation and mitigation and used classifications. Particularly, the difficulty of measuring adaptation expenditures will be discussed and the subsequent choice to use flood control expenditure as proxy will be motivated. Chapter 3 starts with an inventory of possible data sources for adaptation/flood control and mitigation measures and related expenditures. It continues with the discussion of the actual data collection. The results of the study are described in chapter 4. The report ends with conclusions in chapter 5. Chapter 6 of the report gives an overview of the references mentioned in the report.

2. Delineation of the research question

This chapter starts with an assessment of the definitions of adaptation and mitigation measures. Then we describe the sectors responsible for the expenditures. For this study we opted to focus on one of these sectors. Furthermore, we propose the classification to be followed and deal with some other delineation issues.

2.1 Definition of adaptation and of mitigation measures

Mitigation refers to anthropogenic interventions to reduce the sources or enhance the sinks of greenhouse gases, and adaptation is concerned with addressing the consequences of climate change (UNEP, 2008).

2.1.1 Definition of mitigation measures

As mentioned above the following definition for mitigation measures related to climate change is applied:

Mitigation measures are anthropogenic interventions to reduce the sources or enhance the sinks of greenhouse gases.

Starting with mitigating measures for the reduction of the emission of greenhouse gases by sources, this first type of reduction measures can be either direct or indirect. *Direct reduction* means measures that directly reduce the emission of greenhouse gas sources, like for example integrating technologies that make it possible for sources to emit less greenhouse gases. Regulations that stimulate or force companies and households to develop or use these less harming greenhouse gas sources also are considered direct ways to reduce the emission of greenhouse gasses. *Indirect reduction* of the sources of greenhouse gases can be accomplished by the use of alternative means that replace the polluting sources and do not emit greenhouse gasses. A windmill that produces renewable energy as an alternative for the production of energy out of fossil fuels is an example of an indirect reduction measure. Regulations that stimulate or force companies and households to develop or use alternative means also are considered indirect ways to reduce the emission of greenhouse gasses.

A second type of mitigating measures aims at storing emitted greenhouse gases in sinks in order to reduce the amount of greenhouse gas in the atmosphere. Those sinks can be either natural or artificial. Natural storage of greenhouse gasses is done by means of, for example, carbon sequestration in trees and in the ocean. For artificial storage facilities one can think of empty former gas fields (=geological storage).

2.1.2 Definition of adaptation measures

For adaptation measures related to climate change we apply the following definition:

Adaptation measures that deal with the consequences of climate change are responses to actual or expected climatic stimuli or responses to the effects of these stimuli, and they can both be adjustments to natural as well as human systems.

When addressing the consequences of climate change only the anthropogenic adaptations are taken into account. We do not account for animals and plants that change their habits in reaction to climate change, but if human make adaptations to these changed habits we do take these adaptations in account. Apart from negative consequences like floods and hurricanes, climate change can also create beneficial opportunities for innovation in new technologies, new investments in infrastructure, better conditions for agriculture and for stimulating tourism.

Impacts of climate change vary by region. Coastal and mountain areas and flood plains are particularly vulnerable. As a consequence adaptation measures can be very diverse and different between countries or on a regional scale. Adaptation measures therefore need to be carried out nationally or regionally with an integrated and coordinated approach (European Commission Environment Directorate General, 2010).

2.2 Expenditure definition

As defined in the IPCC Fourth Assessment Report adaptation and mitigation costs are the costs of planning, preparing for, facilitating, and implementing adaptation and mitigation measures, including transition costs. This study only considers the financial costs (within a budgetary framework) of adaptation and mitigation options. In contrast, economic assessments consider the wider costs to the national economy as a whole (UNFCCC, 2010). In this paragraph we will first define expenditure within a SNA and SEEA context.

2.2.1 Environmental expenditure in SEEA

Environmental protection expenditure (EPE) according to SEEA is the sum of capital and current expenditure carried out in order to protect the environment (Eurostat, 2008, UN et al., 2012).

In a national account perspective, economic activities and the related transactions are analysed from both supply and use sides, and also placed in a financing perspective. Environmental protection accounts (EPEA) which strictly follows the national accounts, describes environmental protection expenditure according to all these points, thus leading to the calculation of various aggregates that are mainly the output of EP services, the national EP expenditure and the financing of national EP expenditure by institutional sector. From the supply side, environmental protection expenditure concerns all the current transactions (costs of production) and capital expenditure (gross capital formation) carried out in order to produce EP services sold on the market (whatever the name given to the price), provided free of charge or produced for own use (ancillary).

From the use side, environmental protection expenditure includes:

- The domestic uses of EP products (goods and services). These EP products are either services, connected or adapted products. Uses are either final uses or intermediate consumption;
- The domestic gross capital formation for environmental protection;
- Those transfers for EP that are not already reflected in the expenditure recorded under the two previous categories.

2.2.2 EPE for the general government

Basically, for government expenditure, four economic categories of expenditure should be distinguished:

- Purchase of goods and services: it may cover the purchase of goods and services for government own production activities or the purchase of environmental protection services produced by specialised industries under contract with administration;
- Salaries and social security contributions;
- Capital expenditure (gross fixed capital formation and acquisition of land);

- Current and capital transfers (subsidies and investments grants).

General Government can be considered both in its capacity as a producer and consumer:

- In its capacity as a producer, all costs of production and gross fixed capital of General Government are recorded,
- In its capacity as consumer the expenditure made by General Government as a consumer is equal to the value of non-market services produced by General Government and consumed as collective consumption.

The focus in this research is on operational costs, investments in fixed tangible assets and environmental transfers. The operational costs will be split into operating expenses and personnel costs.

Amounts paid to the reserves of certain programs are not included in the expenditure on climate change even though the program itself relates to climate change. These costs do not directly benefit mitigation or adaptation. Withdrawals of reserves to cover climate change expenditures are also not included, because the total expenses are taken into account, which means without deduction of income. Withdrawals of reserves are attributed to the relevant item in its entirety. By taking into account the total expenses, the reserves are indirectly still included.

To prevent double counting, subsidy flows between government agencies are also not included in the total expenditure. Firstly, the government agency which pays the money does not spend it directly on climate change. Secondly, the receiving government agencies spend the subsidy in its entirety to climate change, but as mentioned above, the total expenditures without deduction of income are included. In this way, the subsidies are indirectly still included too. Subsidy flows from government to citizens or companies to stimulate energy saving for example are included. An exception is made for the Directorate General of Public Works and Water management (in Dutch: Rijkswaterstaat) and AgentschapNL (formerly SenterNovem). The Directorate General of Public Works and Water management is the executive body for the Ministry of public works, transport and water management (in Dutch: Verkeer en Waterstaat), which means that all costs incurred of this body are funded by this ministry. These costs are incorporated in the various items of the annual reports of the ministry of public works, transport and water management. By taking into account the relevant items from the annual reports of V&W, indirectly the costs for flood control and mitigation made by The Directorate General of Public Works and Water management are also included. The Ministry of Economic Affairs covers the costs of AgentschapNL. This body is responsible for the implementation of government policy. The total contribution to AgentschapNL is justified on the various policy items of the ministry.

Because of this, only those parts of total contribution are included which are justified under policy articles relevant to climate change.

2.2.3 Primary purpose criterion and climatic share, a practical solution

Mitigation and especially adaptation expenditures often are not solely meant for climate change measures. Most activities that are undertaken to adapt to climate change will have another purpose as well. For example, consider the expenditures for the construction of a climate-proof house that can float with fluctuating water levels[1]. The main purpose of this investment is the provision of housing services.

Similar to the compilation of statistics for environmental protection expenditure (EPEA) and for resource use and management expenditure (RUMEA), we apply the primary purpose criterion. We interpret the primary purpose criterion like that one of the prime motives should be climate change mitigation / adaptation. This means that we account for those activities whose primary motive/objective includes climate change mitigation or adaptation.

Particularly with regard to adaptation applying the primary purpose criterion is problematic. In the Netherlands, most adaptation related expenditures are related to dike construction and maintenance, and the costs for coastal defence (flood protection). In most cases it is impossible to determine if the main purpose is climate change adaptation or "business as usual" protection against floods. For countries that face the risk of flooding due to rising sea levels it may be reasonable to attribute these costs to the consequences of climate change. As half of the Dutch territory is below sea level one could argue that all costs for the defence against water should be seen in the light of climate change. Our initial intention to solve this problem was to determine shares. Which part of the protection measures is flood control and which part is regular maintenance? For the time being it was found that this was too difficult to apply. In this project we decided on the following practical solution:

All expenditures related to flood protection are taken into account, however, this expenditure is not classified as 'adaptation expenditure', but as expenditure for flood control.

In this way we prevent the issue of whether all flood control related expenditure can be assigned as adaptation related. Climate change adaptation expenditures may also include many other areas such health, agriculture, tourism, nature preservation etc. These other categories are very difficult to identify, as they are hidden in other government budget items and not separately identifiable. For this reason, they are outside the scope of this study.

[1] The construction of climate-proof houses is one of the options to adapt to the impacts of climate change. Pole constructions are used so houses can fluctuate with water levels.

2.2.4 Expenditure for assistance to foreign countries

National expenditure for assistance to foreign countries for flood control and mitigation of climate change are included. As the UNFCCC moves towards an agreement on post-Kyoto actions to meet the challenge of climate change, the role of funding for flood control in middle- and low-income countries is taking a central place in the negotiations (Parry et al., 2009). It therefore is essential to have good estimates of expenditures on funding available.

2.3 Who pays?

Expenditures for adaptation and mitigation of climate change are done by either private or public sectors. The government as well as industries and households are faced with a changing climate. Mitigation of climate change could vary from European trading schemes for greenhouse gas emissions to households reducing their direct emissions of carbon dioxide. The same wide scope of actors applies for adaptation to climate change with for example farmers switching to drought resistant crops on the one hand and households increasing their expenses for air conditioners to deal with increasing temperatures on the other hand. National policies play a central role in the struggle against climate change (UNFCCC, 2007). They are not only responsible for public expenditures but also provide incentives for private investors to adapt new physical assets to the potential impacts of climate change.

This report tries to determine the expenditures of the Dutch general government for adaptation/flood control and mitigation measures for the period 2007-2010. The focus of the study was on compiling data for State government and local government as well.

2.4 Classifications

In this study classifications are used to either detect or classify adaptation/flood control and mitigation measures. We propose which classification should be followed.

2.4.1 COFOG classification to detect adaptation and mitigation measures

In 1999 the Organisation for Economic Co-operation and Development (OECD) developed a classification of the functions of government (COFOG) as a standard classifying the purposes of government activities which was published by the United Nations Statistical Division (UNSD). The classification has three levels of detail: divisions, groups and classes. Divisions describe the broad objectives of government, while groups and classes both define the means by which these broad objectives are achieved (European Commission - Eurostat, 2010).

Potentially this general government expenditure by function helps us to detect government's expenditures for climate change adaptation and mitigation. For example COFOG group 05.3 of the division of Environmental protection deals with pollution abatement. Ideally mitigation measures of

the general government should be recorded here. COFOG class 04.74 multipurpose development projects typically consist of integrated facilities for power generation, flood control, irrigation, navigation and recreation. Adaptation expenditures of the general government to protect the country against floods are likely to be found here.

2.4.2 CEPA and CRUMA

The definition and identification of environmental activities has been a focus of environmental accounting for many years. The scope of environmental activities is those economic activities whose primary purpose is to reduce or eliminate pressures on the environment or to make more efficient use of natural resources (UN et al, 2010). These various activities are grouped into two broad types of environmental activity – environmental protection and resource management.Most work has been undertaken on identifying transactions relating to environmental protection activity. The first full articulation of Environmental Protection Expenditure Accounts (EPEA) was presented in the SERIEE 1994, repeated in the SEEA-2003. This was followed by the development of the Classification of Environmental Protection Activities (CEPA) which was finalised in 2000. For resource use and management activities more recently a classification scheme has been proposed (CRUMA) which is adopted in the revised SEEA2012 (UN et al. 2012).

Activities with regard to climate change mitigation can be found in CEPA 1 (Protection of ambient air and climate) and CRUMA 13 (Use and management of fossil energy). With regard to production of energy from renewable resources and energy saving the following is stated in SEEA2012 (par. 4.29 and 4.30):

A particular boundary issue concerns the treatment of activities associated with the production of energy from renewable sources and the treatment of activities associated with energy saving. To a large extent the treatment is likely to depend on the structure of the energy supply in each country. The treatment should be determined on the basis of the primary purpose of the activity whether it is for environmental protection, for resource management, or for the general production of energy.

Where activity related to energy saving and renewable energy sources is of considerable importance, the allocation of this activity to different classes in different situations may impact on the comparability of aggregates relating to environmental protection and resource management over time and across countries. Countries should apply the principle of allocation of these activities based on primary purpose. However, in some cases there may be analytical interest in classifying all such activities under resource management, regardless of the primary purpose, to facilitate international comparisons.

The classification with respect to either CEPA or CRUMA thus seems somewhat arbitrary. Here we opted not to follow CEPA or CRUMA, but to classify all mitigation activities together and add some extra detail in the classification (see below).

Adaptation activities are either environmentally beneficial activities or activities related to minimisation of natural hazards. They clearly are not part of environmental protection activities or resource management activities as this is not their primary purpose. So CEPA or CRUMA cannot be used here for classification of these activities. Below we propose a classification scheme for the adaptation activities.

2.4.3 Classification of adaptation measures

Adaptation measures can be categorised under different themes. In line with the classification followed by the Dutch government (Ministry of Housing, Spatial Planning and the Environment et al., 2007) we distinguish four main themes to address consequences of climate change and climate change adaptation measures as table 1 shows.

Table 1 Classification of consequences of climate change and adaptation measures in four themes.

1. that address safety	e.g. protection against floods, vital infrastructures, evacuation plans
2. that address living conditions/social climate	e.g. heat stress, droughts, diseases
3. that address biodiversity	e.g. policy for preservation of species, adaptation of landscape architecture and nature management, creation of national ecological network to allow migration
4. that address the economy	e.g. groundwater that becomes brackish, obstructed road, water or air transport, benefits for inland tourism

The Dutch strategy gives priority to adaptation measures which regard safety (theme 1). For the Netherlands, which is a coastal area, adaptation measures that focus on defence against flooding are of vital importance (Policy Research Corporation, 2009).

2.4.4 Classification of mitigation measures

In this study mitigation measures are classified in two main categories each broken down into two subcategories (see table 2).

Table 2 Classification of mitigation measures in two main themes with four subcategories.

1. that address reduction of greenhouse gas emissions by sources	
a. direct	e.g. development of energy saving equipments
b. indirect	e.g. stimulating measures for renewable energy
2. that address storage of emitted greenhouse gasses	
a. natural storage	e.g. prevention from deforestation and reforestation measures
b. artificial storage	e.g. carbon capture and storage

2.5 Other delineation issues

2.5.1 Relation to EPEA and RUMEA

There are already several statistics on environmental protection expenditure (EPEA) and resource use and management expenditure (RUMEA) which capture expenditures for climate change mitigation (and to a lesser extent adaptation). For example part of the environmental protection expenditures recorded in CEPA 1 (Protection of ambient air and climate) could be identified as measures to reduce greenhouse gas emissions. As paragraph 2.1.1 showed, these measures fall within the definition of mitigation of climate change. Ideally adaptation and mitigation expenditures should be linked and harmonised with these existing statistics, certainly when much of the same source data is used.

2.5.2 Relation to environmental subsidies

Statistics on environmental subsidies include subsidies for mitigating climate change and adapting to climate change. These subsidies will be included in this study and ideally the expenditures should be harmonised. As mentioned in section 2.2.2 subsidy flows between government agencies are not included. Subsidy concerns only flows from government to citizens or companies to stimulate energy saving for example.

3. Inventory and collection of data

3.1 Inventory of possible data sources

3.1.1 Country level reporting to the UNFCCC

Countries must report government expenditures for climate change adaptation as part of the country level reporting to the UNFCCC in compliance with the Kyoto Protocol. Periodically figures on government expenditure for climate change adaptation must be reported (contribution of Eurostat unit E7 to update of COFOG 2007 handbook). The UNFCCC report of 2007 on 'Investment and financial flows to address climate change' (UNFCCC, 2007) contains data on expenditures for flood control to climate change for the Netherlands. Since estimates are very rough so far, UNFCCC emphasises the need for more accurate and harmonised statistics on climate change mitigation and flood control.

3.1.2 Current environmental statistics and accounts

Indirect, Statistics Netherlands already collect data on expenditures related to mitigation of climate change, but for different purposes. The environmental protection expenditures survey contains data on the environmental domain air (CEPA 1) including data on mitigation expenditures. However the question is which part of the data should be seen as mitigation expenditures. This should be looked up in detail in the source data.

Another possible data source for this project is the study on environmental subsidies. Specifically the information on environmental subsidies related to flood control and mitigation could be useful. In this study we did not examine the data on environmental protection expenditures and on environmental subsidies.

Data on flood control are hard to find in current environmental statistics. Flood control measures are typically meant for purposes other than environmental protection, e.g. infrastructural reasons. Therefore it is better to examine other statistics than the environmental expenditure statistics to detect data on flood control.

3.1.3 Government financial annual accounts and reports

The annual financial accounts by the government should in theory contain all government expenditure on climate change measures. So, financial data from the government agencies may be a very good source and starting point for this project. Annual budget reports and budget data of the central and local government provide essential, detailed information on the items presented in the annual financial accounts. The results described in the next chapter are derived from the budget reports.

3.1.4 Financial reports on mitigation and flood control projects

For every mitigation or flood control project in which the government is involved, there should be a financial report which contains relevant information on the costs. We will not examine financial reports on individual climate change projects because they are hard and/or very labour-intensive to find.

3.1.5 Information from Delta fund

Before the start of the Delta project New Style (in Dutch: Deltaplan Nieuwe Stijl) there was no clear policy program on flood control, rather there were several separate projects. The Delta project New Style is a national program in which there is cooperation between all government agencies. Part of this program is the foundation of the so called Delta fund. Despite the fact that financial reporting is absolutely different from 2011 onwards, this fund will be an important source for the costs of flood control. Therefore, some background information on the history of the development of this program is desirable.

In 1953 there was a big flood disaster in the Netherlands (in Dutch: de Watersnoodramp). As a result a Delta commission was assigned. The main task of this commission was the direct improvement of the water safety in the southwest part of the Dutch Delta. The responsible ministries financed this operation. In 1997 the Delta works were completed. From that moment the emphasis is more and more on making the *whole* Dutch Delta climate proof instead of the improvement of direct safety in the *southwest part* only. Because of this emphasis the Dutch government has assigned the so called commission-Veerman.[2] This "Delta commission" has made some recommendations about the way the water safety can be improved and how the supply of freshwater can be secured in the coming century, taking into account social and climatic developments (Deltacommissie 2008).

As a result of these recommendations a Delta commissioner has been assigned. This commissioner presents a Delta program to the Lower House of parliament and takes responsibility for it. There is a clear accent shift from guaranteeing direct safety of the Dutch Delta to climate proof the Netherlands. Therefore, the Delta law from 1957 has been renewed and came into force in January 2012. This law is the legal basis for the Delta fund introduced in 2011. From 2020 onwards each year at least 1 billion euro will be added to the fund. Until that year all the financial reserves for water safety and freshwater

[2] The commission-Veerman called themselves Deltacommision, but in official terms it was a state commission. At this moment there is no Delta commission in the Netherlands, but a Delta commissioner.

supply in the Infrastructural Fund will be transferred to the Delta Fund. The Ministry of Infrastructure and Environment is responsible for the expenditures of the fund (www.deltacommissaris.nl).

3.1.6 Government statistics from Statistics Netherlands

Government financial reports, as mentioned in paragraph 3.1.3, are an important data source for Statistics Netherlands to compile sector accounts for the government. At Statistics Netherlands use is made of four standard questionnaires to collect that financial data, one for each level of government. As a consequence, there is a chance that the desired level of detail for this project is not included in these questionnaires. Environmental accounts have to be consistent with the definitions of National Accounts, so the department of government statistics is an important source for attaining this consistency as much as possible.

3.2 Collection of data and compilation

3.2.1 General data compilation method

This paragraph describes the general method of compiling mitigation and flood control expenditures. This method applies to all government agencies. In the next paragraphs the focus is on specific methods for each agency separately.

As mentioned in section 2.2.1 the expenditures for mitigation as well as for flood control include operating costs, investments in tangible fixed assets and environmental transfers. When possible, the operating costs are broken down into operating expenses (including capital costs) and personnel costs. It was not always possible to allocate personnel costs directly to climate items. The reason for this is that many times personnel costs are listed in the total of the complete article instead of in the parts of the article. However, in some cases parts of articles are used instead of the entire article. In these cases, the percentage of the relevant section in the article is calculated, and this percentage is put on the total personnel costs of the article. It is usually clear if the article refers to flood control or to mitigation. However, there are some cases this distinction can not be made. This is mainly the case for some projects. When it is not possible to regard an item as flood control or mitigation specifically, the expenditure is divided fifty-fifty.

The data of flood control of all government agencies refer to the period 2007-2010, just like the mitigation data of state government. Data of mitigation expenditure of provinces are available from 2008 onwards. Municipalities are taken into account for 2009 and 2010. There are no data of mitigation expenditure of water boards.

3.2.2 State government

As a first step, we examined the annual reports of relevant ministries, and assigned each policy article to flood control or mitigation. Sometimes, we counted parts instead of a complete article as costs for climate change.

Sometimes, instead of a complete article, parts of it have been counted as costs for climate change.

In general, the data of environmental accounts have to be consistent with the data of National Accounts as much as possible. In this project we want to use the framework of environmental accounts as much as possible. For the finances of the State government the condition of consistency is feasible.

There is an internal database for state government expenditures and finance at Statistics Netherlands, the so called Rijksbestand, in which almost all policy items of all ministries can be found. The data from the annual reports are corrected for definitions of the national accounts and then included in the database of Statistics Netherlands concerning government finance. Using the data from this database instead of the data from the annual reports leads to expenditures that are consistent with the national accounts. Sometimes it was not possible to use the central database, because not all the articles could be detected. If it was clear that an article identified as relevant for climate change, the financial information of the annual reports has been used.

Concluding remarks

- Most items from the annual reports can be linked to the government database of Statistics Netherlands. In this way, the majority of the financial information has been corrected for the definitions of national accounts. Unfortunately, this was not possible in all cases.
- There is no detailed information of investments. The available data within Statistics Netherlands are too aggregated. So, data from ministries lack investments in this research. The annual reports do not contain more information.

3.2.3 Water boards

The water boards are part of the local government. The main responsibilities are the maintenance of dikes and dams, water quality and water quantity. For this project the maintenance of dikes and dams is relevant. This task can be classified as measures of flood control. Partly these costs consist of regular maintenance. However, in this project all costs related to flood control have been taken into account, as it is not possible to distinguish expenditures for regular maintenance and expenditures for climate proof. Another problem is that flood control is intertwined in other items, such as planning, construction costs of additional water storage and salinity control. These data are not available in sufficient detail to take them into account. The decision has been made to include the total costs for

planning with regard to dikes and dams and excluding the other costs. The reason is that it is plausible that a significant portion of the planning costs relates to flood control, because that is the core business of the water boards. The water boards have no significant expenditure for mitigation.

A first step after cost delineation is investigating what data is available within the National Accounts. The environmental accounts have to be consistent to the National Accounts. It became clear that this consistency could not be obtained with regard to the water boards. Within the National accounts, investment data on dikes are available. Data on operating expenses however are too aggregated, making them unusable.

A second step is obtaining data directly from the water boards. Analyzing all the annual reports of each water board for each year is very labor-intensive, because there are 26 water boards in the Netherlands. To prevent this, the Association of Water Boards has been contacted. This institution collects the financial data of all water boards. The requested information of operational costs has been provided, unfortunately total costs minus subsidies instead of total costs without deduction of income. The Association also has provided information about subsidies received on investments and investments made. Data on subsidies related to the operating costs are not available, so in this case the total costs could not be included, but only the net costs. The Association of Water Boards has only provided data on the items that deal with flood control.

Concluding remarks

- Water boards spend some money on energy saving, but data for this expenditure are not available in the annual reports. Mitigation is not the core business of water boards Therefore, mitigation costs of water boards are ignored in this project.
- Flood control is intertwined in many items. It is possible that some items are probably not included, because it is not clear that the item contains expenditure on flood control. So, there is the matter of underestimation.
- Expenditure on dikes and dams consists of two parts. One part contains costs for regular maintenance and the other part is concerned with flood control. Distinguishing these parts is difficult. Therefore, regular maintenance is included in this project. As a consequence, there is the matter of overestimation.
- The net operating costs are provided for this project. This means that the subsidies have been incorporated. This provides an incomplete picture.

3.2.4 Provinces

Provinces have both expenditures for mitigation and expenditures for flood control. Like water boards there are the problems of overestimating and underestimating. If expenditure in the annual report is

regarded as relevant for flood control or mitigation, the amount is included in its entirety, based on the primary purpose criterion. No separation is made between regular costs and costs for climate change. As a consequence, it can be assumed that some items taken into account are overestimated. On the other hand, flood control and mitigation are so intertwined with other items that it is not easy to determine the specific amounts. Determining climate share is out of the scope of this project, so there is the question of underestimation.

Because of the condition of consistency between environmental and national accounts, the first step is looking for data already available. Statistics Netherlands collects also financial data for the provinces. Data of both operating costs as investments are available. However, investment data are not useful, because these data are too aggregate in the questionnaire for provinces. There is useful financial information available for the operating costs on dikes. All other items on the questionnaire are too aggregated for the purpose of this project. For 2007, annual reports are difficult to find, so the only source for this year is Statline. On Statline (under the title government and politics) the operational costs of dikes can be found and serve as estimation of flood control. Note that this is an underestimation of the real expenditure on flood control, because of the lack of other sources. But it is the best estimation for now.
From 2008 onwards we analyzed all the articles in annual reports which could be classified as flood control. This does not only consider dikes, but also the control of muskrat and water storage for example. The expenditures of all the relevant items in the annual reports are summed for each province and compared with the value of operational costs for dikes in the government statistics. Each year and for each province this sum was lower than the value of the government statistics for dikes. In order to obtain consistency with the National Accounts, the difference between the summed items and the value of flood control in government statistics has been assigned to dike costs as mentioned in the annual reports. In this way, the financial data of the annual reports are exactly the same as the data of government statistics. In other words, the data are compatible to the National Accounts without losing their specification. It was deliberately not chosen to use only the value of government statistics. The reason is that it is desirable to have specified measures, such as salinity, water storage and muskrat and so on and so forth. Using the value of the government statistics gives not a clear understanding of the different measures of flood control.

There is no detailed information available for mitigation within Statistics Netherlands for the whole period 2007-2010. So, for 2007 there is no estimation of mitigation because there are no annual reports too for this moment. Of course there are reports, but it is not easy to find them. For the other years there is no consistency with the national accounts for mitigation. Data of mitigation costs come directly from the annual reports, because these data are too aggregated in the government statistics. From the provincial fund money is made available for the so called SLOK scheme. SLOK stands for

Stimulating Local Climate Initiatives. The State government pays money in the provincial fund. This provincial fund can be used by provinces that have submitted applications for this, to finance mitigation projects. These data however, are not usable, because the provinces justify in the annual reports how much they spend on mitigation and energy saving. The benefit of the Provincial fund is a subsidy and, as previously mentioned, subsidies between government agencies are not included.

Provinces justify their investments properly, but few investments can be classified as flood control or mitigation. Provinces spend a lot of money on subsidies to encourage insulation. It is unclear whether these costs are listed separately or included in the articles relating to energy policy. It is likely that the latter is the case.

Concluding remarks

- Within a province, the structure of the annual report can be different each year, making comparison over time difficult.
- Flood control is intertwined in many items. It is possible that some items are probably not included, because it is not clear that the item contains expenditure on flood control. So, there is the matter of underestimation.
- Expenditure on dikes and dams consists of two parts. One part contains costs for regular maintenance and the other part is concerned with flood control. Distinguishing these parts is difficult and out of the scope of this project. As a consequence, there is the matter of overestimation.
- It is not possible for each province to specify the personnel costs.
- The time series currently available are very short.
- Not all provinces report extensively, and as a result not every province can be analyzed as clear as is desirable. In the reports of some provinces is described in detail what is covered by energy policy, other provinces indicate the total spending on energy policy.

3.2.5 Municipalities

The recording of expenditure related to climate change is most difficult for municipalities. Fortunately, flood control is not very important for municipalities as these tasks are mainly carried out by the provinces and water boards. Mitigation costs can be estimated, although not the complete picture can be provided.
At Statistics Netherlands data of operational costs for dikes for 2007-2009 are available and usable for

this research. For 2010, budget estimates have been used. Budget estimates contain the amount of what the municipalities jointly are thinking to spend to flood control (i.e. dikes) in 2010. No further information of investment in flood control or other aspects of water safety is available, so the data of the government statistics are the only source. Using annual reports for more information is not possible at this stage, as this would be very labor-intensive. This task would entail the analysis each year of more than 400 annual reports.

Data on mitigation by municipalities are not directly available at Statistics Netherlands, but a few data have been found. Since 2009 the SLOK scheme is into force. It is supposed that the benefits from the municipal fund are used for mitigation in its entirety. In this way it is possible to make an estimate for the mitigation costs of municipalities. Note that this method can be used for municipalities and not for provinces, because of the lack of annual report data for municipalities. The annual report of the municipal fund provides the total amount of money that has been paid under the SLOK scheme. The subsidies of the municipal fund cover fifty percent of all mitigation costs of municipalities at most. This can be found on the site of AgentschapNL (www.agentschapnl.nl). Therefore, this estimate is incomplete. There are no sources for the other fifty percent.
The SLOK scheme in 2009 succeeded the BANS climate agreement system. BANS stand for Governmental Agreement New Style (In Dutch: Bestuurlijk Akkoord Nieuwe Stijl). Financial data of the BANS system have not been found at the moment. Regarding mitigation costs, municipalities can therefore only be included from 2009 onwards.

Concluding remark: The expenditure data for municipalities is very incomplete. This applies to both the quality and quantity of data.

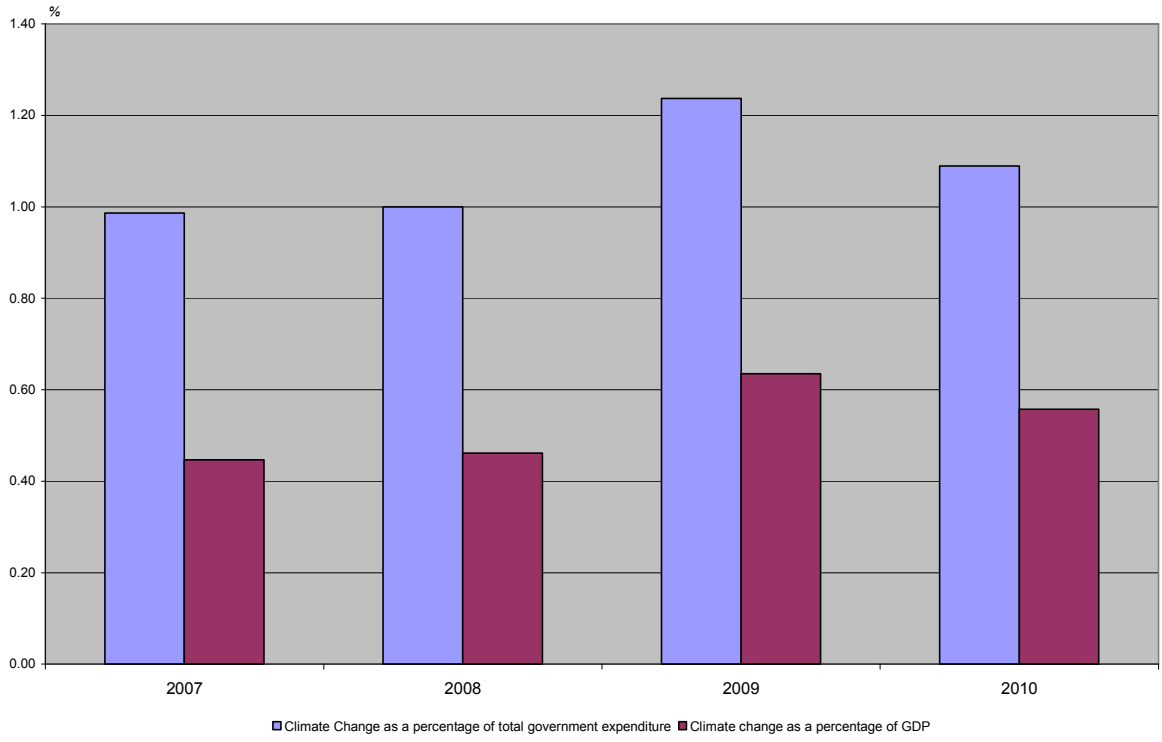
4. Results

4.1 Overview

The expenditure for climate change related issues has increased from 2.4 billion euro in 2007 to almost 3.2 billion euro in 2010. Compared to total expenditure of the government (State government and local) an increase can be observed from 0.99 percent in 2007 to 1.09 percent in 2010. The expenditure can also be compared to the GDP of the Netherlands. In 2007, 0.45 percentage of GDP was spent on climate change, in 2010 this had increased to 0.56 percent. The two main institutional players are the State government and the water boards. Together, they are responsible for more than 90 percent of all the spending on flood control and mitigation. The focus of the State government is on mitigation, whereas the water boards are mainly concerned with flood control. The most important players of State government in the area of climate change are the Ministries of Economic Affairs (EZ),

Agriculture, Nature and Food Quality (LNV), Housing, Spatial Planning and Environment (VROM), Transport, public works and Water Management (V&W), the Infrastructure Fund and the Wadden fund.[3]

Figure 4.1.1 Development of climate expenditure



Source: Annual reports of ministries, provinces, water boards and municipalities 2007-2010 and CBS, National Accounts.

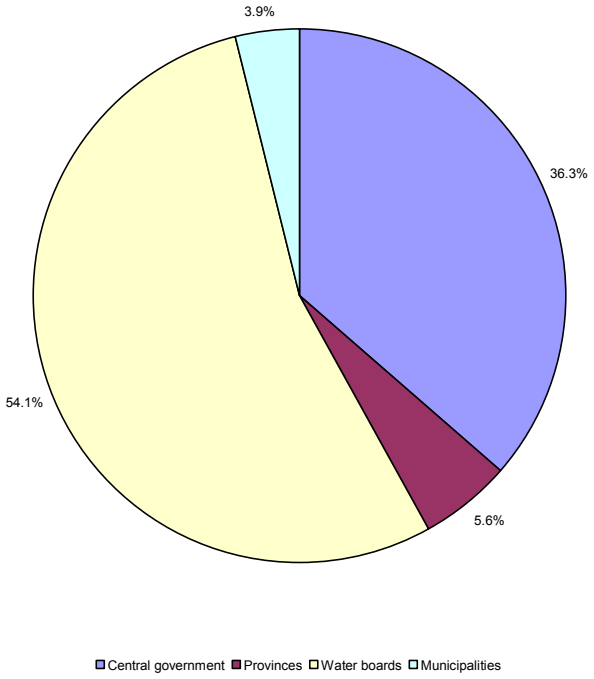
Total climate change expenditure as a percentage of GDP showed a peak in 2009. The reason is a significant increase in spending by the State government as a result of an amended registration for the items which are important for this research. In 2009, GDP in current prices showed a sharp decline.

[3] From January 2011 there has been a change in the composition of the ministries. EZ and LNV form the new Ministry of Economy, Agriculture & Innovation (EL & I). VROM and V & W are covered by the new Department Infrastructure & Environment (I & M). As a consequence financial reporting will be absolutely different from 2011 onwards. The most recent year in this research is 2010, therefore, use is made of the old nomenclature.

4.2 Flood Control

On the basis of the relevant items from the annual reports flood control expenditures can roughly be classified into three categories. These categories are not based on an official classification.[4] The categories are 1) maintenance of dikes and coastal defense, 2) programs and research and 3) other expenditures related to water safety. The latter category includes costs for muskrat control and water storage for example. In 2010, 0.34 percent of GDP, or nearly 2 billion euro, was spent on flood control.

Figure 4.2.1 Allocation of expenditure for flood control to different government agencies 2010



Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

The State government spent over 726 million euro on flood control in 2010. About two thirds was designated to the maintenance of dikes and coastal defense. The government is responsible for the maintenance of the primary coastal defenses such as the Delta Works. Another major category is "research and projects". Only 0.5 percent of the money was spent on personnel costs.

A large amount of money in the category “research and projects” is spent on the programs Room for the River (in Dutch: Ruimte voor de Rivier) and River Meuse (in Dutch: Maaswerken). The first program focuses on facilitating the outflow of rivers in order to increase security to protect nearly four

[4] Expenditures according to the official COFOG classification will be discussed further on.

million people against flooding. In about thirty subprojects different locations are addressed. The program River Meuse focuses on a natural and better navigable Meuse and protection against flooding of this river. In about 52 subprojects, nearly 222 km Meuse has been secured. A third important and well-known program that falls under this category of expenditure is the program Knowledge for Climate Research (formerly Climate and Space). Knowledge for Climate Research (in Dutch: Kennis voor Klimaat) is a research program for the development of knowledge and services that makes it possible to climate proof the Netherlands. Knowledge is developed within the research program that is necessary to be able to assess investments to be made in spatial planning and infrastructure over the coming twenty years in terms of their resistance to climate change, and for making changes where necessary. (Source: http://kennisvoorklimaat.klimaatonderzoeknederland.nl). There are also several other programs included in this category, such as the high water protection program (Hoogwaterbeschermingsprogramma), Weak Links of the Coast (Zwakke schakels Kust) and Living with water (Leven met water).

The provinces also have the focus on dikes and coastal defense. Like the State government, they also have a lot of expenditure for other measures of water safety than dikes, but research is considerably less important than it is for the State government. The provinces have especially expenditures for practical measures. Most of these expenditures go to the personnel costs of muskrat control. Collectively, the provinces spent almost 113 million euro on flood control in 2010. In the same year municipalities spent 79 million on dikes and water safety.[5] There are no data available of other measures for flood control for the municipalities.

The water boards are the biggest players in the field of flood control. In total nearly 1.1 billion euro was spent here in 2010. This amount goes in its entirety to the maintenance of dikes and flood protection.[6] Water boards are responsible for the upkeep of regional barriers. Slightly more than half of the budget was spent on investments in reinforcements of dikes and pumps. The rest of the budget consisted of operating costs, including personnel costs.

4.3 Mitigation

Mitigation in the Netherlands represents a relatively smaller part of all expenditures on climate change than flood control. In 2010, 0.22 percent of GDP was spent on mitigation, which equates to almost

[5] This is a preliminary figure based on the municipal budgets for 2010.

[6] The figures of the water boards are difficult to classify. For this reason, everything is allocated to flood protection and dikes.

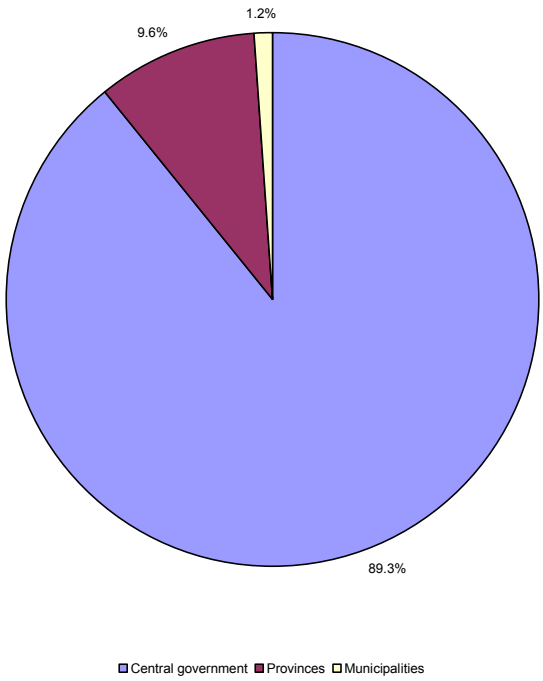
1.3 billion euro. The State government is responsible for nearly 90 percent of all mitigation expenditure. The measures are very diverse:

- General climate policy. This is a very wide area. The most important expenditures are stimulating energy saving and environment-friendly building.
- International / Kyoto: These are expenditures related to joint implementation and the clean development mechanism projects which are financed by the State government in order to comply with the agreements from the Kyoto protocol.
- Projects / programs / research: This category includes the financing of the Dutch research center for renewable energy (ECN) and projects of AgentschapNL (formerly Senter Novem) as well as projects for underground storage of CO_2 for example.
- Horticulture: stimulation programs for horticulture to invest in renewable energy.
- Subsidies: subsidies and schemes to promote energy saving and reducing greenhouse gas emissions, such as the CO2 reduction plan and the renewable energy subsidies (MEP, SDE[7]). Subsidy flows from one government agency to another to finance climate costs are excluded, only the flows to households and companies are included.
- Mobility: examples in the context of mitigation are stimulation of natural gas as fuel instead of petrol, green seats in the aviation and New Driving (in Dutch: Het Nieuwe Rijden).
- Renewable energy sources. This includes expenditures for wind and solar energy for example.

The category ‘subsidies’ includes measures that provide fiscal advantage for the citizens and companies. These fiscal investment grants mean there is a loss in revenues for the government. In principle, these losses can be seen as costs, but these costs are not included here. The amounts of subsidies in this project are only the actual expenditures of the government.

[7] The subsidy SDE (IN Dutch: stimulering duurzame energie) has been ended in December 2010 and replaced in 2011 by the subsidy SDE+.

Figure 4.3.1 Allocation of mitigation expenditures to different government agencies 2010



Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

In 2010, nearly three-quarter of the mitigation budget of the State government was spent on subsidies. This was almost 836 million euro. By far the largest part went to the Ministerial Regulation Environmental Quality Electricity Production (MEP), but also the contribution to the Dutch Energy Research Foundation (ECN) and the Energy Research Grants scheme (EOS) were considerable costs .[8] This latter scheme was abolished in 2011. The remaining quarter of the mitigation budget mainly was spent in the categories of general climate policy and mobility. Note that expenditures within the scope of Europe are rather low in spite of the rules, objectives and protocols the Netherlands have to fulfill. Just under 2 percent was spent on personnel costs.

Provinces spent their 122 million mitigation budget in 2010 almost entirely on general climate policy. The picture here is probably biased because of aggregated reporting of some provinces. Costs are quickly justified under item totals such as climate policy or energy policy without specifying them. This does not alter the fact that provinces indeed spend a lot of money on general climate policy. Additionally, provinces spend a considerable amount of money on projects and research in the area of mitigation. It is not possible to specify these projects, because in the annual reports all the provinces

[8] These flows of money exist already for a long time, even before climate change was a hot topic. In this study energy policy is taken into account in a broader sense, so the expenditures of mitigation include these two flows.

call this ‘projects related to climate change’. Only Utrecht has reported more specific projects such as Energic Utrecht (in the sense of more green energy) and energy-saving lighting. Personnel costs are often hidden in the items totals and therefore difficult to determine.

The mitigation expenditures of municipalities are determined on the basis of data from the Municipal Fund. Under the scheme Stimulating Local Climate Initiatives (SLOK) in 2010 over 15 million euro was paid from the Municipal Fund. This is not more than 50 percent of all mitigation costs, because 50 percent is the maximum coverage of the SLOK scheme. Further information on mitigation expenditures of municipalities is not known. Therefore, the overall picture is not complete.

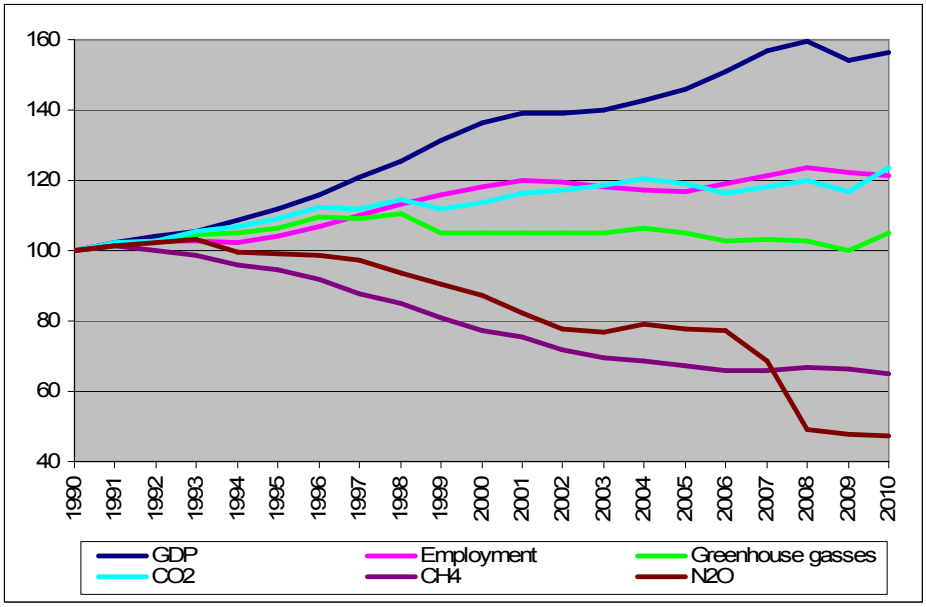
4.4 The benefits of mitigation: what has it achieved?

As described above, expenditures related to climate change amount to significant amounts of money. The measures related to these expenditures resulted in less greenhouse gas emissions, more production of renewable energy en some new business opportunities. Below we will describe what was achieved in the past 20 years. It should be stressed that these benefits cannot be exclusively linked to government measures. First, the benefits described cannot exclusively be ascribed to government measures. Some was achieved by companies or households themselves. Secondly, we have only a short time series for the mitigation expenditures, while the time series for greenhouse gasses and renewable energy production are much longer.

Here we focus on the benefits for mitigation, as is more difficult to quantify the benefits of flood control, moreover as these benefits may to a large degree be obtained in the future.

4.4.1 Emissions of greenhouse gases

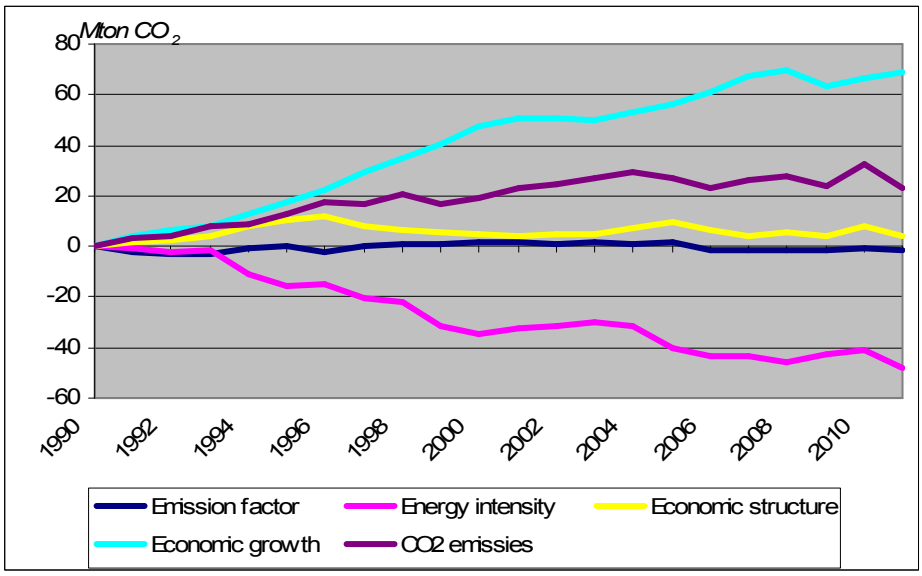
Figure 4.4.1 Volume changes GDP, employment and greenhouse gas emissions by industries



Source: environmental accounts of the Netherlands 2010 (CBS,2011)

In the time period 1990-2010, we see that economic growth was considerably higher than the increase in greenhouse gas emissions. While the economy grew at a rate of 56 percent and employment by 21 percent, the emissions of greenhouse gases by industries increased only by 5 percent. Accordingly, relative decoupling took place in the Netherlands: i.e., the growth rate of greenhouse gases from production processes was lower than the GDP growth rate. Absolute decoupling only took place for methane and N_2O emissions.

Figure 4.4.2 Structural decomposition analysis of CO_2 emissions



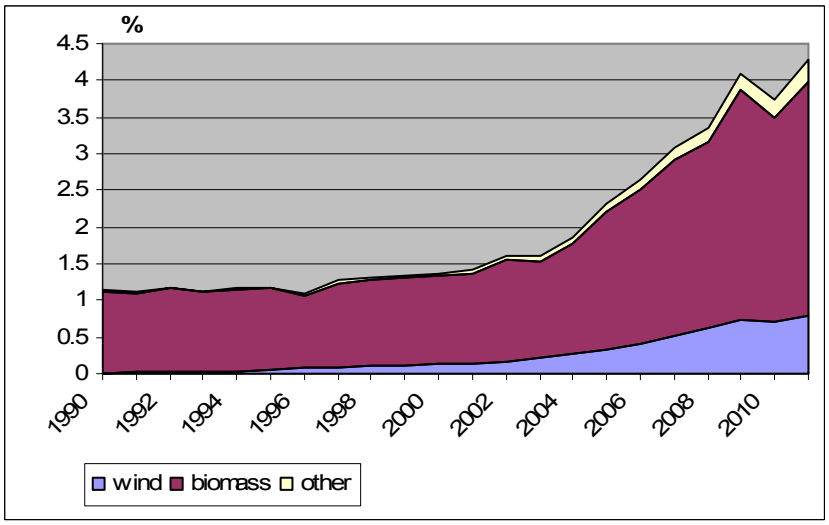
Source: environmental accounts of the Netherlands 2010 (CBS,2011)

Structural decomposition analysis allows us to account in detail for the factors underlying the changes in emissions and to determine the impact of efficiency measures. During the last twenty years economic growth clearly has been the driving force behind the increase in CO_2 emissions, which were only partially negated by an increase in efficiency (emission factor and energy intensity effect). Emissions would have been about 66 percent higher than in 1990, if there had been no change in efficiency and structure. The improvement of the energy intensity (energy saving) has reduced the increase in CO_2 emissions in particular. Structural changes in the economy or a change in the mix of energy products clearly had less effect on the total change in emissions.

4.4.2 Renewable energy

From 1990 to 2003 the use of renewable energy increased slowly from 1.1 percent to 1.6 percent of final energy consumption. This is an increment of about 0.05 percent point a year. In the period 2003-2011 the increase was 0.4 percent point a year. This acceleration was mainly caused by the subsidy scheme for the production of renewable electricity. A second effective measure of the government was the obligation for sellers of petrol and diesel on the Dutch market to sell biofuels. This obligation increased gradually from 2 percent of all sold petrol and diesel in 2007 to 4 percent in 2010.

Figure 4.4.3 Share renewable energy in total energy consumption



Source: Statline Renewable energy: use (CBS, 2012)

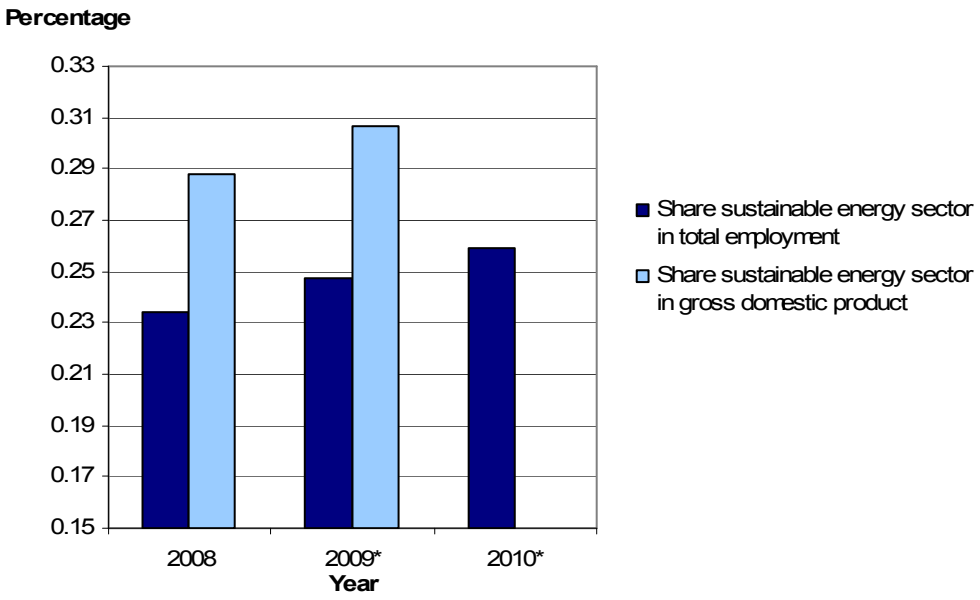
4.4.3 Renewable energy sector

Climate change mitigation not only results in, but may also create new economic opportunities for businesses. The sustainable energy sector consists of all companies and institutions that physically produce renewable energy (exploitation phase) as well as companies active in the value chains that come before it (pre-exploitation phase). Apart from renewable energy, the sustainable energy sector also includes companies and institutions that focus on energy saving activities.

Share of the sustainable energy sector in the Dutch economy

The sustainable energy sector accounted for 0.25 percent of total employment in 2009. In 2008 this was 0.24 percent, and in 2010 0.26 percent. The share in gross domestic product is slightly larger, 0.31 percent in 2009. This share has also grown over time, see figure 1. The indicators share in employment (fte) and share in gross domestic product (GDP) are potential indicators for the green growth framework.

Figure 4.4.4 Share of the sustainable energy sector in the Dutch economy



Source: Statistics Netherlands 2012, Economic Radar of the Sustainable Energy Sector in the Netherlands.

Table 4.4.1

Key figures for Sustainable Energy Sector (SES)		2009	2010
%-change			
Employment [1]		4	4
Production		-7	na
Value added		2	na
Import of goods		3	na
Export of goods		22	na
Gross fixed capital formation:			
Demand side exploitation phase		-38	37
Pre-exploitation phase		12	na
Innovation (R&D expenditures per euro turnover, change 2008-2010)			20
	2008	**2009**	**2010**
absolute values			
Employment[2] (FTE, rounded)	16 000	16 700	17 400
Production (mln euro, rounded)	5 160	4 800	na
Value added (mln euro, rounded)	1 710	1 750	na
Import of goods (mln euro, rounded)	2 232	2 300	na
Export of goods (mln euro, rounded)	1 806	2 200	na
Gross capital formation:			
Demand side exploitation phase (mln euro, rounded)[3]	1 400	870	1 190
Investments pre-exploitation phase	234	261	na
Innovation (R&D expenditures per euro turnover[4], %)	2.0	na	2.4

[1] 2010 growth figure for P-SES equal to 5 percent

[2] Includes only employees on the payroll of SES companies. Employees hired from temp. agencies are not included

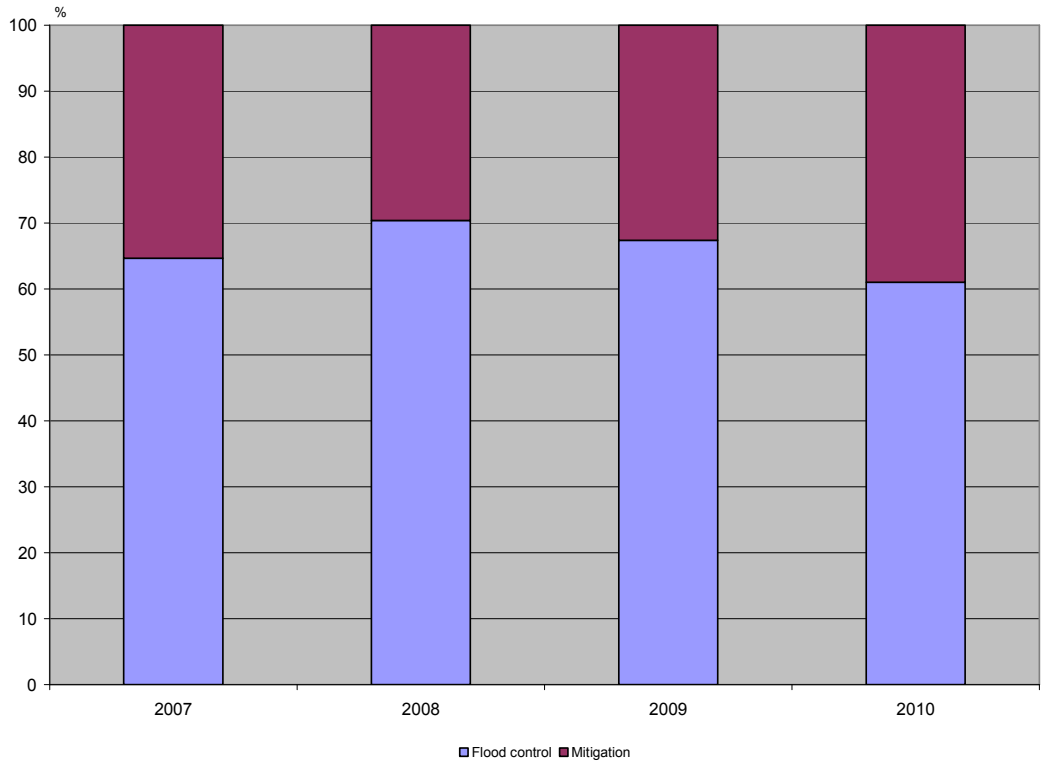
[3] Includes only projects reported to the EIA scheme, based on financial reports by A-NL

[4] 2008 figure has changed compared to previous Radar results because of comparabilty reasons. This figure includes only companies of ten or more employees. Figures only representative for medium-sized and large companies

4.5 Comparison of flood control and mitigation

In the Netherlands the government expenditures for flood control are higher than for climate mitigation. Nearly sixty percent of expenditures in the context of climate change is spent on flood control. Water boards are the main contributor. Both the State government and the provinces focus on mitigation. Yet a shift in flood control responsibilities is visible. Water boards are becoming a less important player and the provinces take more tasks for their account. This has to do with the political desire for fewer administrative layers. Nevertheless, the proportion of the water boards in the total costs for flood control in 2010 is still over 54 percent. In 2007 this was over still 61 percent. Over the years, mitigation has become more important. This is partly explained by more complete source data of the local government agencies. However, the effect of the availability of additional data for municipalities and provinces in later years is very low. The main reason is the increasing effort by government to reduce the greenhouse gas emissions.

Figure 4.5.1 Ratio of flood control and mitigation



Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

The expenditures for climate change can be divided into groups of measures. The tables below show the measures for the central as well as the local government. The personnel costs of the State government are listed separately. For local government, these measures are included in the amounts. This is because it is not possible for each government agency to specify personnel costs for each measure separately.

Table 4.5.1

Central Government Expenditure by measure

	2007	2008	2009	2010
	million euro			
Flood control				
Dikes/Flood protection	289.6	406.1	587.3	492.4
Other measures of water safety	10.1	13.2	13.1	16.6
Projects / programs / research flood control	162.0	160.6	207.3	207.6
Other measures of flood control	6.1	6.4	10.2	6.3
Personnel costs	7.8	2.8	3.1	3.9
Flood control total	**475.6**	**589.1**	**821.0**	**726.8**
Mitigation				
Climate policy / Energy saving	52.3	51.4	63.7	97.5
International / Kyoto	35.1	49.5	61.2	28.6
Projects / programs / research mitigation	22.2	22.5	18.3	16.6
Horticulture	9.6	20.1	24.1	19.1
Subsidies	602.2	496.2	810.6	835.8
Mobility	163.1	96.5	75.9	85.7
Alternative energy sources	-	1.1	2.1	33.0
Temporarily measures	-	-	-	3.4
Personnel costs	17.4	19.4	20.8	21.8
Mitigation total	**901.9**	**756.6**	**1,076.7**	**1,141.6**

Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

Table 4.5.2

Expenditure provinces by measure

	2007	2008	2009	2010
	million euro			
Flood control				
Dikes/Flood protection	85.8	71.5	85.6	87.4
Coastal Vision	-	1.3	1.4	1.8
Other measures of water safety	-	22.9	27.8	22.6
Projects / programs / research flood control	-	2.9	3.5	1.1
Flood control total	**85.8**	**98.6**	**118.3**	**112.9**
Mitigation	-	0.0	0.0	0.0
Climate policy / Energy saving	-	52.9	86.8	107.9
Projects / programs / research mitigation	-	2.85	4.5	10.9
Horticulture	-	-	0.1	0.6
Subsidies	-	0.5	0.8	2.4
Mobility	-	0.2	0.1	0.2
Alternative energy sources	-	0.1	0.2	0.3
Mitigation total	**0.0**	**56.6**	**92.5**	**122.2**

Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

Table 4.5.3

Expenditure municipalities and water boards by measure

	2007	2008	2009	2010
	million euro			
Flood control municipalities				
Dikes/Water protection	77.0	80.0	89.0	79.0
Flood control water boards				
Dikes/Water protection	1014.1	1166.0	1426.8	1083.8
Flood control total	**1,091.1**	**1,246.0**	**1,515.8**	**1,162.8**
Mitigation municipalities				
Climate policy / Energy saving	-	-	15.9	15.2
Mitigation total	-	-	**15.9**	**15.2**

Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

4.6 COFOG classification

The expenditures on mitigation and flood control of the State government may also be displayed in the COFOG classification. This makes an international comparison possible. An explanation of this classification can be found in paragraph 2.4.1. In the appendix to this report the entire classification has been included. The expenditure of provinces and municipalities are more difficult to classify in the COFOG classification. In addition, the measures of these government agencies are less diverse. Note that the results of table 4.5.3 are not comparable with the data at Statline, despite the fact that the same COFOG classification is used. Reason for this is that climate expenditure is a very specific part of the total COFOG expenditure and this total expenditure is presented at Statline.

Table 4.5.4

Central government expenditure by COFOG category

	2007	2008	2009	2010
	million euro			
COFOG code				
052	7.8	3.4	1.5	1.4
053	235.5	173.9	170.4	147.0
061	16.5	16.2	20.3	63.4
0411	11.4	11.9	12.6	12.6
0421	9.6	20.1	24.1	19.1
0430	3.5	11.8	682.9	720.1
0435	537.3	408.9	43.8	28.3
0474	435.8	576.5	806.2	715.2
0481	76.8	98.4	112.0	135.1

Source: Annual Reports ministries, provinces, water boards and municipalities 2007-2010

The increase in 2009 for code 0430 (fuel and energy) and the decrease for code 0435 (electricity) in the same year are remarkable. The reason is that expenditures on the MEP scheme are a lot higher from the year 2009 and that the classification was adjusted. Until 2009 the MEP was registered under code 0435 and from 2009 under code 0430. Besides the above categories, 053 (pollution control) and 0474 (developing projects with multiple purposes) are key posts. Many mitigation measures fall under pollution control. The post ‘developing projects with multiple purposes’ includes almost all measures related to flood control.

5. Conclusions and recommendations

The main questions of the underlying research are the following:

- What are the total costs for flood control and mitigation for the central and local government over the period 2007-2010?
- What is the quality of the data?
- Is it feasible and desirable to compile this overview every year?

5.1 Total expenditure for flood control and mitigation

The extensive answer on the first question can be found in the analysis of the results in chapter 4. The total expenditure on climate change was almost 3.2 billion euro in 2010. Nearly 60 percent of all costs to climate change were spent on flood control. Only 40 percent was mitigation expenditure. The focus of the State government is on mitigation, while the water boards are the main contributors to flood control.

As a percentage of GDP climate change expenditure become more and more important. In 2007, 0.45 percent of GDP was spent to climate change and in 2010 this has risen to 0.56 percent. If the Netherlands wants to fulfill the European rules, these expenditures are too low (Ministry of Economic Affairs, Agriculture and Innovation 2012). Mitigation measures have already resulted in several benefits, but the increase of the use of renewable energy is too slow. In 2020 at least 14 percent of gross energy consumption has to be renewable (Ministry of Economic Affairs, Agriculture and Innovation 2012). With the current development of increasing use of renewable energy this goal is not feasible.

5.2 Quality of the data

The quality of the data varies among the four government agencies. So, this question will be answered for each agency apart.

1) **State government:** Use is made of the data delivered by the ministries. These data are made consistent with the definitions of National Accounts by the department of government statistics at Statistics Netherlands. So the data are of a good quality and are easily available. The data are also highly detailed, both for flood control and mitigation. For each policy article of the annual reports data are delivered and nearly all of these data can be made consistent to the definitions of the National Accounts. There is just one comment. This quality applies only

to the operational costs. Detailed information about investments is not delivered and the available data within Statistics Netherlands are not useful because of the aggregated level.

2) **Water boards:** Use is made of the data delivered by the Association of water boards. As a result, the quality is good and the data are easily available. There is information about investments and operational costs. The Association of water boards has delivered only the data which are related to flood control. Within this area, the data for both operational costs and investments are very detailed. The available data at Statistics Netherlands are too aggregated, so it is good that the Association of Water boards has delivered in detail. The only comments are that the operational costs are net, i.e. with deduction of income and the data are not fully consistent with National Accounts.
3) **Provinces:** use is made of the annual reports. Provinces do not directly deliver data, so the annual reports are the only financial source. The available data of operational costs as well as investments at the department of government statistics are not useful, because they are too aggregated. Therefore, there is no consistency with the National Accounts with the exception of the operational costs of dikes. Because the annual reports are used the quality of the data is good and the reports are easy to find from 2008 onwards. The main problem is that provinces report at a high aggregated level, so it is not always possible to give an exact estimation.
4) **Municipalities:** The data for municipalities are very hard to find. It is labor-intensive to read all the annual reports of the more than 400 municipalities and at the department of government statistics the available information is also too aggregate. The only source for flood control is one value at Statline, just for dikes. And for 2010 there is only one budget estimation. For mitigation, the annual report of the municipal fund is the only source. Data about the grants of the SLOK scheme cover fifty percent of all the mitigation expenditures at most.

5.3 Feasibility and desirability

To answer the question of feasibility we have to look at five aspects of the data: availability (easy to find and on time), quality, the degree of detail and the degree of consistency with National Accounts. It is better to answer this question for flood control and mitigation separately. Also a distinction has to be made between central and local government.

5.3.1 State government

	Mitigation	Flood control
Availability: easy to find	Very good	Very good
Availability: on time	Data ministries t+5* and data	Data ministries t+5* and data

	Rijksbestand t+9*	Rijksbestand t+9*
Quality	Very good	Very good
Detail	Very good	Very good
Consistency National Account	Good (not all items)	Very good (all items)
Feasibility	YES	YES

* in months

5.3.2 Water boards

	Mitigation	Flood control
Availability: easy to find	Not available	Very good
Availability: on time	Not available	Provisional t+3 (yearly). Final t+10 and t+22 (biannual)
Quality	Not available	Very good
Detail	Not available	Very good
Consistency National Account	Not available	No
Feasibility	NO	YES

5.3.3 Provinces

	Mitigation	Flood control
Availability: easy to find	Good	Good, not for every province data available
Availability: on time	Differences between provinces. First reports at t+5.	Differences between provinces. First reports at t+5. Data government statistics t+18
Quality	Good	If available quality is good
Detail	Reasonable, there are differences between provinces	Reasonable, there are differences between provinces
Consistency National Account	No	No, only for the item ‘dikes’
Feasibility	YES, no delay because reports are the only source.	YES, with small gaps and some delay because of t+18

5.3.4 Municipalities

	Mitigation	Flood control
Availability: easy to find	Yes, but too much reports	Yes, but too much reports
Availability: on time	First reports at t+5.	First reports at t+5. Data government statistics t+18
Quality	Bad	Bad, only the item 'dikes' has a good estimation
Detail	No judgement	No judgement
Consistency National Account	No	No, only the item 'dikes'
Feasibility	NO	NO

5.3.5 Conclusion of feasibility

For the greater part it is feasible to make a yearly overview at least for operational costs. However, it would be advisable to make it biannual, mainly because of the availability of the data of the water boards, which are an important player in the area of flood control. The data of the provinces at the government statistics of the item 'dikes' are also available than at least for one year and hopefully a provisional estimation for the other year. The final data of flood control of the water boards are available in 2012, 2014 and so on. The advice is to make the statistics in these years. It would be nice if mitigation can be added to these data, but mitigation is not a core business of water boards. It is recommended not to take municipalities into account and focus on operational costs for State government and provinces. In addition it is recommended to take investment data of the water boards into account, because it is a large part and the quality of the data is good. Investment data of state government and provinces have to be improved before they are useful. Note that for the local government consistency with National Accounts is very low. So, third parties can make the overview of the local government by themselves. But still the best option is a two-yearly statistics including the local government for the complete view of the expenditures related to climate change.

5.3.6 Demand for data

In the Netherlands, there is a high demand for data on climate change related expenditure. From the point of view of policy makers and decision makers it is desirable to make a yearly overview of the expenditures of climate change with a high level of detail as soon as possible. This has become clear from direct questions from parliament and discussions with the National Audit Office. At this moment

Statistics Netherlands is not able to deliver all the data that is required by policy makers and researchers. For example, more measures of adaptation than just dikes and muskrat are wishful. More detail in the current data of flood control and mitigation, especially for provinces, is also one of the questions.

On the other hand, Statistics Netherlands can fill a substantial gap with this study in the current policy reports. A lot has been written about climate change, but determining the government costs of mitigation and flood control is far from easy, even for the concerned departments. It is important to stress again that the results of adaptation in this research may not be classified as 'fully climate change adaptation related' as a large part of these expenditures can be seen as 'business as usual'. Further research is needed to determine whether it is possible to make this distinction. Nevertheless, many policy makers (for example political parties, National Audit Office) have indicated that the results of this project are a welcome supplement to their own research activities and decision making.

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Annex 1 COFOG (Classification of the Functions of Government)

01 - General public services

- 01.1 - Executive and legislative organs, financial and fiscal affairs, external affairs
- 01.2 - Foreign economic aid
- 01.3 - General services
- 01.4 - Basic research
- 01.5 - R&D General public services
- 01.6 - General public services n.e.c.
- 01.7 - Public debt transactions
- 01.8 - Transfers of a general character between different levels of government

02 - Defence

- 02.1 - Military defence
- 02.2 - Civil defence
- 02.3 - Foreign military aid
- 02.4 - R&D Defence
- 02.5 - Defence n.e.c.

03 - Public order and safety

- 03.1 - Police services
- 03.2 - Fire-protection services
- 03.3 - Law courts
- 03.4 - Prisons
- 03.5 - R&D Public order and safety
- 03.6 - Public order and safety n.e.c.

04 - Economic affairs

- 04.1 - General economic, commercial and labour affairs
- 04.2 - Agriculture, forestry, fishing and hunting
- 04.3 - Fuel and energy

04.4 - Mining, manufacturing and construction

04.5 - Transport

04.6 - Communication

04.7 - Other industries

04.8 - R&D Economic affairs

04.9 - Economic affairs n.e.c.

05 - Environmental protection

05.1 - Waste management

05.2 - Waste water management

05.3 - Pollution abatement

05.4 - Protection of biodiversity and landscape

05.5 - R&D Environmental protection

05.6 - Environmental protection n.e.c.

06 - Housing and community amenities

06.1 - Housing development

06.2 - Community development

06.3 - Water supply

06.4 - Street lighting

06.5 - R&D Housing and community amenities

06.6 - Housing and community amenities n.e.c.

07 - Health

07.1 - Medical products, appliances and equipment

07.2 - Outpatient services

07.3 - Hospital services

07.4 - Public health services

07.5 - R&D Health

07.6 - Health n.e.c.

08 - Recreation, culture and religion

08.1 - Recreational and sporting services

08.2 - Cultural services

08.3 - Broadcasting and publishing services

08.4 - Religious and other community services

08.5 - R&D Recreation, culture and religion

08.6 - Recreation, culture and religion n.e.c.

09 - Education

09.1 - Pre-primary and primary education

09.2 - Secondary education

09.3 - Post-secondary non-tertiary education

09.4 - Tertiary education

09.5 - Education not definable by level

09.6 - Subsidiary services to education

09.7 - R&D Education

09.8 - Education n.e.c.

10 - Social protection

10.1 - Sickness and disability

10.2 - Old age

10.3 - Survivors

10.4 - Family and children

10.5 - Unemployment

10.6 - Housing

10.7 - Social exclusion n.e.c.

10.8 - R&D Social protection

10.9 - Social protection n.e.c.