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WATER ACCOUNTS AND THE WATER FRAMEWORK DIRECTIVE

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Abstract
The implementation of the European Water Framework Directive has increased policy and decision-maker demand for integrated hydro-economic information at the level of river basins. In order to meet this increasing demand, a new integrated hydro-economic accounting system has been developed in the Netherlands, based on the water accounting framework. The Dutch water accounts provide information about the interactions between the physical water system and the economy at national and river basin scale. This involves not only linking water related environmental data to economic data, but also presenting these data at the relevant geographical scale through appropriate up and downscaling procedures. It is this issue of matching available data across various spatial scales, which has proven to be one of the major challenges in the compilation of a new integrated river basin information system. The use and usefulness of the integrated river basin information system will be demonstrated for the implementation of the WFD based upon available time series data.

Introduction

Since a number of years, the demand for information about the economic value of water and the wider economic consequences of water policy and management has increased rapidly. In Europe, the introduction of the **European Water Framework Directive** (2000/60/EC) has given this demand an important impetus. The Water Framework Directive (WFD) is one of the first European directives in the domain of water, which explicitly acknowledges the important role of economics in water policy and management.
The **implications** of the WFD include[2]:

- an increase in the demand for water-related data of various kinds (water supply and use, economic data, water quality etc.) that are integrated and consistent;
- an increase in the availability of data that are comparable across countries, not least to facilitate the consolidation of river basin district plans comprising several countries;
- better studies of the costs and prices of water services, including as specified in the WFD the environmental and resource costs;
- more focus on the geographical boundaries of the data, i.e. water bodies and river basin districts.

In order to meet this growing demand, the possibilities of linking existing water information systems to the economic accounting system have been investigated in the Netherlands (de Haan, 1997; van der Veeren et al., 2004) [3]. This research has resulted in the creation of a new integrated water economics information system called the National Accounting Matrix including Water Accounts (NAMWA), which is based on the system of integrated environmental and economic accounting (SEEA).

This paper presents an **overview of the various opportunities that an integrated river basin information system offers for the implementation of the WFD**, not only on a national, but also at river basin level. The Dutch Water accounts provides information about the interlinkages between the physical water system and the economy at national and river basin scale. This involves not only linking water related environmental data to economic data, but also presenting these data at the relevant geographical scale through appropriate upscaling and downscaling procedures. The success of the new developed information system is shown by the fact that the official river basin characterisations in the Netherlands for the WFD in

[2] European Task Force on Water Satellite Accounts (2002, p.4).
[3] De Haan, M. (1997); Water accounts in the Dutch NAMEA: A "NAMWA" for 1991. Centraal Bureau voor de Statistiek, Voorburg. Van der Veeren, R., Brouwer, R., Schenau, S. and van der Stegen, R. (2004). NAMWA: a new integrated river basin information system. RIZA report 2004.032. RIZA, Lelystad, The Netherlands.

2004 (sent to the European Commission) are based on the Dutch system of water accounts. So, the new information is actually used by water policy-makers and water managers.

The Dutch water accounts

In the beginning of the 1990s, Statistics Netherlands extended this National Accounting Matrix with a 'satellite account', which includes the environmental pressures related to the production of goods and services. This resulted in the **National Accounting Matrix including Environmental Accounts** (NAMEA), which is published annually by Statistics Netherlands (e.g. de Haan and Keuning, 1996) [4].

Following a pilot project in 1997, the Dutch system of environmental accounts was extended in 2002 with the **National Accounting Matrix including Water Accounts** (NAMWA). NAMWA is a further specification of NAMEA for water, using the same basic structure as the NAMEA. The Dutch water accounts presents information at the level of the four main river basin districts in the Netherlands: Rhine, Meuse, Scheldt and Ems (Figure 1). In view of the fact that the Rhine basin covers approximately 70 percent of the entire Dutch territory - making it difficult to carry out any meaningful analysis - this basin is furthermore split up into four different subregions: Rhine-North, Rhine-West, Rhine-East and Rhine-Centre. The water accounts combines three different types of data and includes an economic account, an emission account and a water extraction and discharge account[5]. The Dutch water accounts are published annually by Statistics Netherlands. The Institute for inland water management and wastewater treatment (RIZA) uses the water accounts for making the reports regarding to the Water Framework Directive.

[4] de Haan, M. and Keuning, S.J. (1996). Taking the environment into account: the NAMEA approach. Review of income and wealth, Series 42, Number 2, 1996.

[5] For more information on the Dutch water accounts see Brouwer, R. Schenau S.J. and van der Veeren, R. (2005), Scale issues in an integrated hydro-economic river basin accounting system. UNECE Statistical Journal (in press).

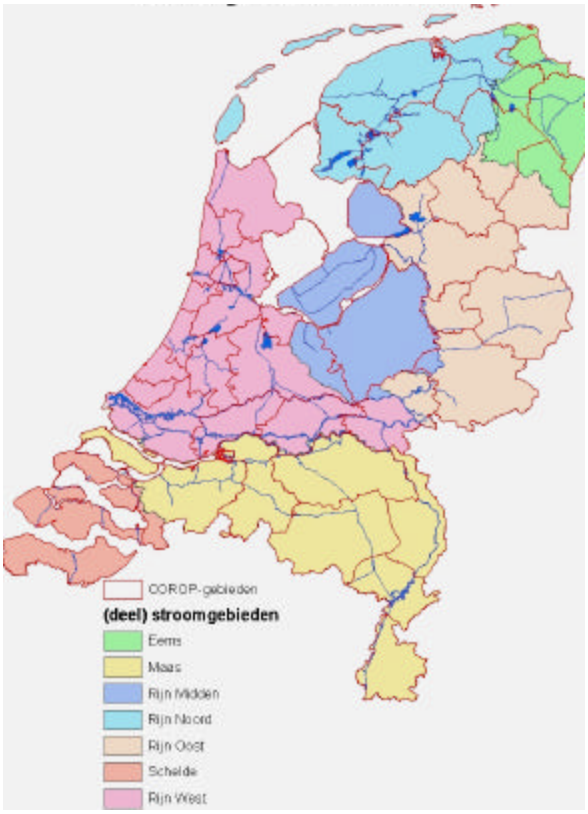

Figure 1: The Netherlands split up in the seven river basins distinguished in the WFD.

Water accounts and the implementation of the Water Framework Directive

The WFD requires that river basins across Europe are described in both physical and economic terms. According to Article 5, the economic characterisation of river basins should include an assessment of (Wateco, 2002):

- the economic significance of current water use;
- future water use up to 2015;
- current levels of cost recovery of water services.

A. The economic significance of current water use

The Wateco guidance document[6] provides some first guidelines on how to prepare an economic analysis of current water use and their economic importance. According to the Wateco guidance, this step will require a high level of coordination with other experts and stakeholders to build a common knowledge and representation of the river basin. First, water uses and services should be identified by socio-economic sector (agriculture, industry,

[6] WATECO (2002). Guidance document. The Water Economics working group Wateco was one of the European working groups set up under the Common Implementation Strategy of the Water Framework Directive (WFD) with an aim to provide guidelines for the economic analysis in the WFD. This resulted in 2002 in the Wateco guidance document.

households and recreation). Secondly, one should assess the relative socio-economic importance of the identified water uses. Potential indicators to assess the socio-economic importance of the identified water uses are value added, employment and volumes of water demand. The main outputs of this step in the economic analysis are key indicators of economic significance of water uses. Key is to collect information that is relevant to water management issues in the river basin and to key economic sectors likely to be affected by the Directive Implementation. The Dutch Water accounts are usefull to derive integrated indicators of the economic significance of current and futur e water use.

Essentially, the economic significance of water use in the different river basins is measured in two different ways. Economic significance is measured through production values and value added generated in river basins per sector (expressed in euros), while water use is measured through water extraction (expressed in cubic metres) by economic activities on the one hand and the emission of polluting substances (expressed in kilograms) per sector on the other hand. Water use can furthermore be measured through wastewater discharge per sector in each river basin (expressed in inhabitant equivalents).

B. Prediction of trends in future water use

Based on time series analysis, possible trends can be identified. In the Dutch Water accounts, trends in economic driving forces can be linked to pressures such as water consumption, wastewater production and the emission of polluting substances (nutrients, metals etc.). An example is given in Figure 2. At a national level, real economic growth (in terms of GDP in constant prices) over the period 1996-2001 was 18 percent (on average 3 percent per year). Total wastewater production remained more or less the same over that same period, whereas the emission of nutrients decreased significantly by approximately 15 percent and the emission of metals by about 10 percent. Figure 18 hence seems to suggest that economic activities use the water environment in a more efficient way.

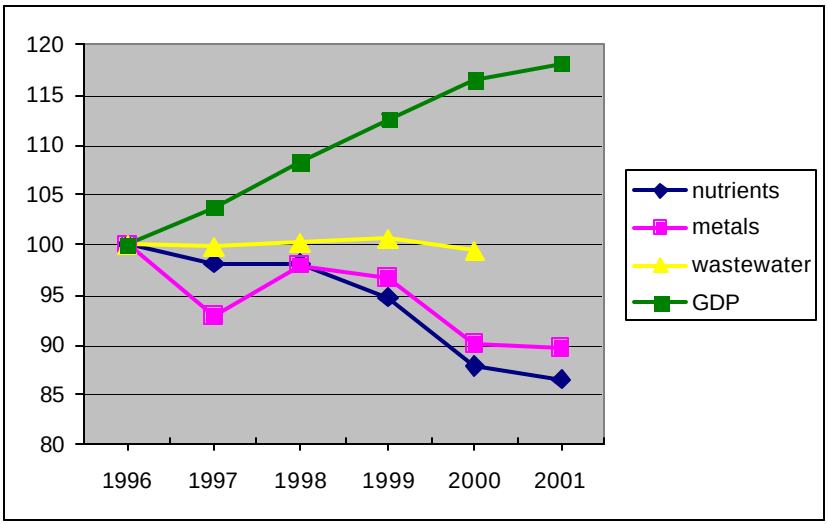

Figure 2: Economic growth, wastewater production, emission of nutrients and metals (excluding import) in the Netherlands over the period 1996-2001 (1996=100)

These types of indicators are helpful in assessing the success (or failure) of environmental (sector) policy, as they provide important insight in the environmental efficiency of economic activities, i.e. the relationship between production output and the use of the environment or environmental inputs. They may also provide a basis for trend analysis. Based upon the observed development of economic activities within sectors and corresponding water use over the past 5 or 10 years, one can extrapolate this development into the future. An important condition obviously is that one has to be able to identify a trend first. Needless to say that these numbers have to be used very carefully in any analysis and should, if possible, be supplemented with more 'qualitative data' regarding expected regional, national or international (sector) policies and/or technological changes.

C. Cost recovery rates

As the water accounts provide information about the production value (at basic prices) of activities, goods and services, and contains information about the revenues from water related taxes, it is in principle possible to calculate cost recovery rates for specific water services based on NAMWA. Cost recovery is defined here as the ratio between the revenues paid for a specific service and the costs of providing the service.

A first step in calculating cost recovery rates is to identify the specific water service involved. The following services are generally distinguished in the context of the WFD:

- drinking water supply;
- wastewater collection;
- wastewater treatment.

As an example we will discuss wastewater treatment here. Wastewater treatment is mainly the responsibility of the regional water boards. For this water service households, industry and agriculture pay a water pollution levy to water boards, which covers the operation and maintenance costs of the wastewater treatment facilities.

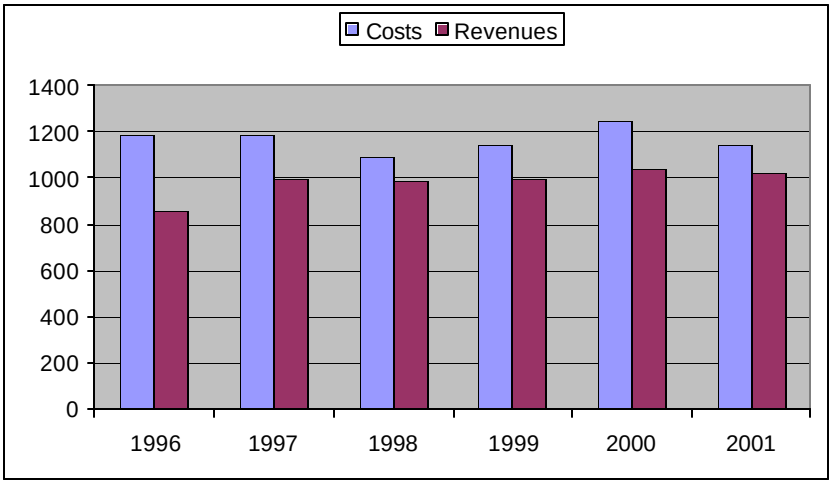

***Figure 3**: Total costs and revenues of the water service wastewater treatment (in million euros)*

On a national level, the cost recovery rate for wastewater treatment varied over the period 1996-2001 between 73 and 91 percent (Figure 3). Based on the location of water boards (and their corresponding service area), the cost recovery of wastewater treatment can be calculated at both national and river basin level. Also the sectors who pay for the water pollution levy are known, making it possible to also assess the relative contribution of each sector to the recovery of the costs of the water service.

Discussion and concluding remarks

It is important to **clarify** to water policy and decision-makers how to use the water accounts and how to interpret the information supplied by these information systems. Even though the source and destination of the flow of goods and services (and associated water and substance flows) can be traced with the help of the water accounts, the information still has to be interpreted with the necessary care in view of the fact that possible important indirect relationships are not included. Relating the water accounts to the Driving forces-Pressure-State-Impact-Response (DPSIR) framework, the water accounts describes the driving forces related to the water system, such as specific economic activities and sectors. These driving forces exert different types of pressures on the water system, such as water extraction and emissions to ground and surface water.

In some cases, pressures, such as the emission of phosphorus or nitrogen, organic pollution and heavy metals, are linked to state variables, based on their contribution to environmental themes such as eutrophication, wastewater, and the distribution of heavy metals in the environment. The impact of water policy and management responses on the water system and their effectiveness can be derived from the Dutch water accounts in principle through time series analysis of water use and emissions to the water system. In short, the Dutch water accounts describes the pressures exerted on the water system, not the state of the water system or the impact of emissions on this state. Based on time series analysis, one can get an idea about the impact of policy and management responses on these pressures though, but this kind of analysis usually requires also a more in-depth assessment of the various influencing factors that may have played a role in the observed trend.

Based on time series, trends can be identified, which may provide an important input in the scenario's that have to be developed for the WFD, for example in order to select a cost-effective programme of measures in the WFD. The description of the economic situation in river basins helps to determine the economic interests involved in water use and emissions, which in turn plays an important role in the determination of issues in the WFD like disproportionality and derogation. Although water accounting provides information about the use of different water services and the associated financial transfers and transactions, the calculation of cost recovery rates for water services for the WFD, requires additional information. Moreover, calculating these rates at river basin level also still proves to be difficult, mainly because of lack of sufficient information.

Box 1: The usefulness of the water accounts at national and river basin level

- General policy evaluation:
  - Information that enables policy makers to assess current policy (description).
  - Description of the current situation as a starting point to predict the effects of future policy (forecast).
- Specific indicators that show:
  - Value added of water in national and regional economies.
  - Costs and revenues in the water sector.
  - Environmental costs related to water.
  - Pressure on the water system by economic activities.
  - Efficiency of water use.
  - Production costs of water services.
  - Level of cost recovery.
  - Degree to which the Polluter Pays Principle applies.

In conclusion, by linking water and substance flows to economic flows and doing this systematically for a number of years, **insight is gained into the (nature of the) relationship between our physical water system and the economy**. The integration of physical and economic information also allows the construction of integrated indicators. For instance, water use by various economic sectors can be related to the economic interests involved. It is this integration of water and economy at river basin level, which makes water accounting an **important information tool** to support policy and decision-making in the field of integrated water management as advocated by the WFD. By linking information about the physical pressures exerted on the water system by economic agents and the associated economic interests, the water accounts enables policy makers and water managers at national and river basin scale in a consistent way to assess the necessary measures to reduce these pressures and meet the environmental objectives in the WFD in an integrated way. Water accounting offers opportunities to analyse the trade-offs between environmental goals and the economic interests involved at the relevant level of analysis, i.e. river basins (see also Box 1).

<u>Questions to the UN Committee</u>

- Do you agree that water accounting can be an important tool for the implementation of the WFD?
- What actions should be taken to promote other countries to develop water accounting frameworks and to establish the link with the WFD?
- What should be the task of the UN Committee in this?