New developments in the Emission Inventory of the Netherlands

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Abstract
The emission inventory in The Netherlands has al long history. In 1974 it was set up for the assessment of the emissions of pollutants to air and water of major industrial plants in the Netherlands. Over the years methodologies were developed to estimate emissions of all industrial activities. Also non industrial sectors were included in the inventory such as agriculture, consumers and waste sector. At this moment the inventory covers all possible sources of air pollution and water contamination. The inventory has an annual cycle which results in a national database which is used to fulfil all (inter)national obligations to report data on emissions such as UNFCC, CLRTAP). In recent years vast effort has been made to speed up and streamline the data-process of the emission inventory and the subsequent reporting from the database. By means of state of the art WEB technology emission experts can upload all emission data to the database. After the necessary QA/QC procedures the database is published on the internet. Not only the emission figures but also graphics and maps can be presented based on the user preferences. In this way The Netherlands is able to meet the requirements of the Aarhus convention.

Keywords: Emission Inventory, PRTR

Introduction
This paper describes the new developments in the Emission inventory of The Netherlands in historic perspective. The Dutch national emission inventory is one of the oldest in Europe and contributed to the development of other inventories European countries. Because of its long history the current inventory process bears relicts from the past which makes it difficult to adjust to the new quality requirements from (international) users of the emission data.

A Short History of the Dutch Emission Inventory.
In the beginning of the seventies of last century the Dutch Ministry of Environment and developed a plan to register the emissions of polluting substances to air and water from the major industrial companies in the Netherlands. The aim of the inventory was to create a dataset of emission data for environmental relevant pollutants. The data should also give insight in the geographical distribution of the emissions in the Netherland. The time series of the emission data then could be used for policy evaluation and the development of abatement scenarios.

The first pilot inventory started in 1974 in one of the 12 provinces of the Netherlands. The companies were visited by TNO specialist to identify the relevant polluting processes and

they used, whenever possible, plant specific data to estimate the emissions. In the case no emission factors could be derived from literature, emission measurements were performed. These data were then used to specify emission factors for the given process. These emission factors were then applied to estimate the emissions from comparable processes. The emission data for each company were included in a database including process descriptions, stack data and emission parameters. In this way the data could also be used for dispersion modeling. Please note that the industry's involvement in the emission inventory was merely voluntary. There was no legal requirement to participate in the inventory.

Besides the emissions of industrial plants also the emissions from "collective" sources were included in the inventory. These emissions like from transportation, agriculture, consumers, and airports were estimated using statistical data and national emission factors. The national statistical office and the ministry of transport and water joined the emission inventory to supply data and contribute to the emission estimates for these collective sources.

In 1975 the inventory for the first province was ready and the results were that promising that the project was continued for the next province. This process continued and over the years 12 reports on the provincial emission inventories were published. Until that time the emissions of more than 6400 companies were registered. Data analysis showed that for the future inventory rounds 1500 companies would suffice to get a representative picture of the main industrial emission sources in the Netherlands. The data of the 4900 companies registered in the earlier rounds were used to derive emission factors for specific industrial branches. For these branches (with minor emissions) it was decided upon to make national estimates in the future.

Finally in the year 1990 the first report on the national emissions was published which gave an overview of the emissions during the years 1983 to 1987. The inventory included the emissions from 1500 individual companies, completing estimates for the non registered industrial companies and "collective" emissions for all other non industrial sectors.
Because growing demand for recent emission figures, to both air and water, the ministry of environment decided to develop an annual inventory cycle with the aim to publish annually a report on the emissions to air and water in the Netherlands. The inventory data should be the unique source for all national reporting obligations.
From 1992 to 2001 the annual emissions in the Netherlands were reported in writing. From 2001 onwards emission data are being published on the internet, first in an emission data warehouse which in recent years was rebuild into a more user friendly system which will further be developed into the reporting tool for EPRTR (http://www.emissieregistratie.nl). From this national database all national reporting obligations are fulfilled (CLRTAP,UNECE, UNFCCC, EU Water Directives) and the requirements of the Aarhus convention.

The current emission register system is characterized by the following five dimensions:

- Sources: 1200 different emission sources are defined
- Compartment: emissions to air, water and soil are included
- Pollutant: over 350 pollutants are included
- Time: the register includes full datasets for the years 1990, 1995, 2000, 2005, 2006 and 2007. For the greenhouse gasses complete time series from1990 to 2007.
- Location: all emissions are geographical distributed in a GIS system. Point sources on exact location, diffuse sources are allocated on a 5 x 5 km grid.

Annual Emission Inventory Process

Because of the annual reporting obligations to (inter)national bodies the inventory has an annual cycle. The Ministry of environment has appointed the Netherlands Environmental Assessment Agency (MNP) as responsible body for the Dutch Emission register. The data from the emission register are used by the agency to evaluate and predict future levels of environmental contamination. The emission data are also used by other ministries and organizations (such as Statistics Netherlands). By participating in the inventory these organizations ensures their specific needs are covered by the inventory.

The actual national emission estimates are made by five, so called taskforces:

- Taskforce on Energy, Industry and Waste Management - ENINA:
  Covers the emissions to air from the sectors Industry, Energy production, Refineries and Waste management. ENINA has emission experts from the following organizations: Netherlands Environmental Assessment Agency, TNO, Statistics Netherlands, Institute for Inland Water Management and Waste Water Treatment, SenterNovem Waste Management Department and FO-Industry.
- Taskforce on Transportation
  Covers the emissions to soil, water and air from the transportation sector (aviation, shipping, rail and road transport). The following organizations are represented in this task force: Netherlands Environmental Assessment Agency, Statistics Netherlands, Institute for Inland Water Management and Waste Water Treatment and TNO.
- Taskforce on Agriculture an Land Use Change
  Covers the calculation of emissions to soil, water and air. Participating organizations are the Netherlands Environmental Assessment Agency, LEI, Alterra, Statistics Netherlands, EC-LNV and the Institute for Inland Water Management and Waste Water Treatment.
- Taskforce on Water - MEWAT
  In the task force water the emissions from all sector to water are calculated. The Institute for Inland Water Management and Waste Water Treatment, National Institute for Coastal and Marine Management, Netherlands Environmental Assessment Agency, Statistics Netherlands and TNO are represented.
- Task force on Consumers and other sources of emissions - WESP
  Covers emissions caused by consumers, trade and services. The members are emission experts from Netherlands Environmental Assessment Agency, TNO and Statistics Netherlands.

The large industrial sources have an obligation by law to report their emissions to air and water (in the past year) to the competent authorities before the 1st of April. To streamline and standardize the annual environmental reporting (AER) an internet tool is made available to the industry. After completion of the emission data the electronic form is send to the competent authorities for quality control. After approval, the data are made available to the emission inventory.

The data on air emissions from the AERs are used by the taskforce ENINA to complete the emissions for the total industry (including the industry with no AER obligation such as SME). Emission factors are derived from the AER and multiplied by relevant (statistical)

activity data. This exercise yields the industrial emissions for the Netherlands which consists of two parts:

- Emissions for large point sources (AER);
- Completing estimates for industrial sectors with no AER obligation.

The emissions to water for the large point sources are estimated in the same way as explained aforesaid by the taskforce on water. For water emissions difference is made in direct and indirect emissions. The first one are, as the word says, emissions directly into surface waters. Indirect emissions are those emissions which are drained into the sewer system. The extensive sewer system (over 98 percent of the companies and consumers is linked to the sewer system) collects the emissions to WWTPs. The emissions from these plants are calculated separately and then included in the inventory. The main item of interest for water is the load of pollutants to surface water. This load not only consists of emission but also the deposition of pollutants to water. The deposition is calculated using emission data from the Dutch air emission inventory and emission data from neighboring countries.

The other taskforces use statistical data and (country specific) emission factors to calculate the emissions to the atmosphere and surface water. Please note that all emission estimates are national figures.

The calculations of the taskforces are performed at the offices of the participating organizations. In the past the data from the taskforces were send by post, later by fax and until a few years ago by email to the database manager. The database manager then included the data into the data base. In 2004 the responsibility for the database management was transferred by the ministry from TNO to the Netherlands Environmental Assessment Agency. The reason for this was bipartitely. First; by laying the responsibility at the Agency, they would be optimal equipped to monitor the environmental policy of the ministry (which is its prime task). Furthermore the agency had experience in the automation of data transfer and it was anticipated that the efficiency of the data process could be improved. In the years 2004 to 2006 the emission database was rebuild and equipped with web based interfaces to facilitate the data process.

The annual data process follows the following scheme:

October - January:	Taskforces prepare emission estimates for the year t-2;
1st of February:	All emission estimates for the year t-2 have to be uploaded to the database;
Beginning of March:	Final check of emission data (t-2) in a joint meeting of all taskforces;
End of March:	All member organizations of the inventory give the final approval on the t-2 emissions. These approved data will be used in all reporting to (inter)national bodies.
March to June:	Geographical allocation of the national emissions and publication on the website;
March to June:	Taskforces prepare emission estimates for the year t-1;
16th of June:	All emission estimates for the year t-1 are uploaded to the database;
End of June:	Final check of emission data (t-1) in a joint meeting of all taskforces;
15th of July:	All member organizations of the inventory give the final approval on the t-1 emissions. These approved data will be used in all reporting to (inter)national bodies.

The above scheme could not be shortened during introduction of the new automated data processing system. This is due to the fact that the availability of statistical data (needed for the emission calculations) could not be put forward. The major improvement of the new system compared to the old one is the fact that the taskforces can ad new, or change data at all times without intervention of the database manager. The database manager is only needed when new sources have to be included in the database and for "maintenance" of the numerous coding lists (e.g. for geographic allocation and reporting categories).

Future challenges and planned new developments

In the past thirty years the trend in annual budget for the Dutch emission inventory shows a continuous decrease. The automation of the data process is nearly completed and this development improved the efficiency to some extent. At this moment the inventory is on the horns of a principal dilemma, decreasing funding but demand for better quality.

Decreasing funding:

The money available for the emission inventory is still decreasing. As pictured out above the emission inventory is characterized as a project with the involvement of a great number of organizations. Although the primary process is slimmed down in the past decade there is still a lot of consultation between the partners needed to reach agreement on the emission data. Costs could be reduced by cutting the involvement of some of the organizations.
On the other hand new organizations in the surrounding environment make an appeal to the inventory or they are trying to get influence in the data process (emission trading scheme, GHG reporting and EU regulations). These contradicting developments can only be merged by a clear perception of the role that the emission inventory should play in the environmental policy of the Netherlands. The ministry of environment as principal financier of the inventory should redefine the tasks of the inventory. From this principal task the necessary involvement (and tasks) for the different organizations should be derived and redefined.
Up to now the responsibilities in the inventory were well defined but the division of the tasks and budgets were not always in line.

Demand for better quality:

In the past decade the inventory was focused at optimizing the data process and dealing with the decreasing budgets. This was the reason for low investment in the maintenance and development of estimation methodologies. But at the same time the reporting obligations increased and more detailed and consistent data series are now required. Also the demand for better local and regional emission data is increasing because land- and city development is linked to air quality. Local dispersion calculations need local emission data of good quality. In the local context even minor emissions (which are not that significant on a national scale) are relevant. Furthermore the emission inventory for large point sources changed. The companies themselves got the responsibility for the emission data. Whereas in the past the emissions from these plants were calculated by independent specialists the quality control for the emission figures is now in the hand of the competent authorities which are not yet well equipped to accomplished this task.

In contrast to the past, emissions from individual companies only have to be reported above a defined threshold value. The minor emissions from the companies are not longer included in the inventory. And because the emissions from large point sources (in the Dutch methodology) also determine the emission estimate for the smaller companies we are now loosing emission data for the pollutants which are emitted in smaller quantities.

Above mentioned changes are now recognized and we are working on solutions:
The annual budget for the inventory does now include a cost centre for methodological improvements. Research is now ongoing into the possibilities to use permit information to asses the emissions of PM_{10} from SMEs. On a voluntary basis local competent authorities are provided with a simple tool to asses the PM_{10} emissions and transfer them to the national database. The idea behind this development is that more localized emission data will be made available and this may improve the evaluation of the Dutch PM_{10} reduction policy.

The intention is also to assess the abatement technologies now in use in the Dutch industry. In the past this information was available in the emission inventory but it has not been updated since the mid nineties due to budget cuts. This lack of information on abatement technology in the Netherlands impedes the development of new emission reduction schemes.

The quality control for the emission data from large point sources is now partly the responsibility of the taskforce ENINA. By providing the competent authorities with easy to use control instructions will improve the data quality. The taskforce can then use their resources to develop and or improve top down estimation methods for non reported emissions.

The website of the Dutch emission inventory is also intended to be used to inform the public. The current website is developed for and by specialists. In order to maximize the use of the website by the general public the user interfaces will be improved. Furthermore the geographical distribution of the emissions after approval of the national dataset takes a few months. Research is ongoing to speed up the geographical distribution.

Reporting of emission data to international organizations is now well defined. Electronic tools are now developed to automatically retrieve the required data (emissions and activity data) from the database with an output in the required reporting format. This will reduce reporting time and errors.

Conclusion

Although the Netherlands emission inventory has a long history, this did not proved to be a guarantee for optimal use of resources. Confronted with new uses of emission data, new reporting requirements, and decreasing budgets the future priorities for the inventory should be redefined. IT technology proved to be a useful instrument to improve efficiency of the data process but this technology can not replace the need for attention to methodological issues.

References

www.prtr.nl:
This website is an English version of the inventory website and gives access to a broad spectrum of documents (often in Dutch) concerning the Dutch emission inventory.