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Pollutant Emission Register in the Netherlands

P.G. Ruyssenaars, C.W.M. van der Maas, A.J. Leekstra, G.J.C. Stolwijk
Environmental Assessment Agency, the Netherlands.
Information Services and Methodology (81)
PO Box 303
3721 MA Bilthoven, the Netherlands

Abstract

In the Netherlands, the first steps for the establishment of an integrated Pollutant Release and Transfer Register (PRTR) were made in 1974. Since then, following the developments of ICT, several updates of the database application have been performed including a close integration with GIS. In the last eighteen months, a new update of the application and database has been carried out. The objective was to develop an integrated web-based tool allowing:

- the emission inventory experts to annually update their emission calculations on-line;
- the database management group to calculate emission totals at the national level in order to comply with international formats for reporting to the EU and UN, like CRF and NFR, but also the regional and local level (provinces, water boards, municipalities, 5*5 km);
- to show emissions to the public, as an implementation of the Aarhus requirements;
- to allow the professional "data-user" (policy-advisors, modeling experts) to extract data from the database.

The new database comprises emission data on air, water as well as on soil. Furthermore, the database integrates emission data of large point sources and diffuse sources. Emissions form large point sources are derived from the Annual Environmental Reports (AER). The electronic application of this AER is linked to the national PRTR database. Emissions from diffuse sources at the national level are calculated by emission experts, on the basis of activity data and emission factors. After approval of these data by the involved institutes, these data are regionalized geographically Emissions of large point sources are located at the location of the site; diffuse sources on the basis of GIS and a number of general parameters (like population density, animal density, traffic intensity).
The emission data from this database are used to evaluate environmental policy at the (inter)national as well as the regional level.

The PER system in the Netherlands

The ultimate goal of environmental policy, is improvement of the quality of the environment. The effectiveness of policy in that context may improve if it is based on up-to-date and accurate information about the development of emissions from all relevant sources to al compartments at the correct spatial level. In the Netherlands, the development of a *Pollutant Emission Register* (PER) started in 1974. Based on the development of national environmental policies and international regulations (like the *Convention on Long Range Transboundary Air Pollution,* CLRTAP; the *United Nations Framework Convention on Climate Change*, UNFCCC and the *Aarhus Convention* and it's European elaboration in the *European-Pollutant Release and Transfer Register*, E-PRTR), the Dutch *Pollutant Emission Register* project comprises nowadays the inventory, analysis, localisation and presentation of emission

data of both industrial and non-industrial sources in the Netherlands for several hundreds of substances.

The PER is the national instrument to monitor the emissions from all sources to all compartments (air, water and soil) on a (sub-)national scale. Groups of emission experts (called Task Forces) collect the data required and perform emission calculations. Agreement on definitions, methods and emission factors is discussed and reported by experts in these Task Forces. Emission data is gathered for the following so-called *Target Sectors*: industry, energy sector (e.g. public utilities), transport, households and services, agriculture and natural sources. The emissions of large industrial point sources are registered individually, based on their annual environmental reports (in Dutch: MJVs). The emissions of all other sources are calculated with statistical activity data and emission factors. The emission data are updated every year and stored in the central national database, the PER, from which information for national policy, international reporting obligations and research applications is provided (*Figure 1*).
The *Netherlands Environmental Assessment Agency* (MNP) co-ordinates the annual compilation of the PER on behalf of the *Ministry of Housing, Spatial Planning and the Environment* (VROM). Each year emission data are (re)compiled for the years 1990, 1995, 2000 and *t-3*, *t-2* and *t-1* (i.e. now 2006) for about 160 substances. Where possible, they also report the emissions for the other years between 1990 and *t-3*. The PER is established in co-operation with a number of institutes, among which *Statistics Netherlands (*CBS) and the *Netherlands Organisation for Applied Scientific Research* (TNO).

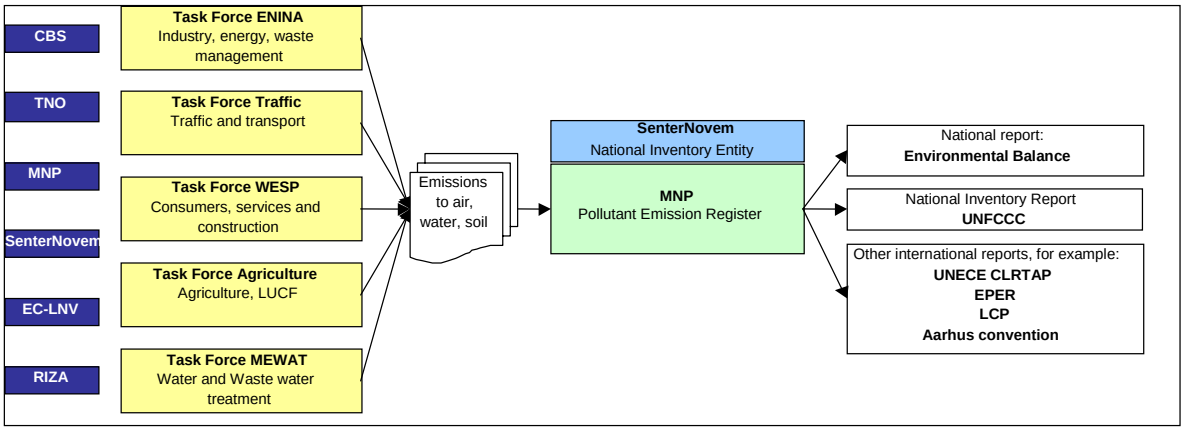

Figure 1*: Organisation of the PER project in the Netherlands, 2004.Source: Environmental Assessment Agency*

Spatial allocation of national emissions
Based on the calculated national total emissions, of which the process is briefly described above, the Dutch PER also calculates the emissions per gridcel (5*5 km), community, water catchment area and at provincial level.
To calculate this spatial information the Emission Register has for each emission source a spatial map, for example for emissions related to road traffic a map with the traffic intensity for each road in the Netherlands. Or in the case of agricultural emissions, a detailed map of land use.. A geographical information system (GIS) is used to translate these different intensity maps from one spatial unit to the other, for example which part of a road is inside a 5 * 5 gridcel or which percentage of the surface of a grid is in a certain province. The following figures give some examples

of the various maps with intensities used. Point source emissions on a known location are treated slightly different: these emissions are subtracted from the national total. The rest of the emissions of an industrial sector are spatial located based on there number of employers for each sector (based on there NACE code). The result is adequate for a national view. However, because of the limited reliability, these data have are limited applicable for local or regional evaluations. Some examples of maps used for spatial allocation:

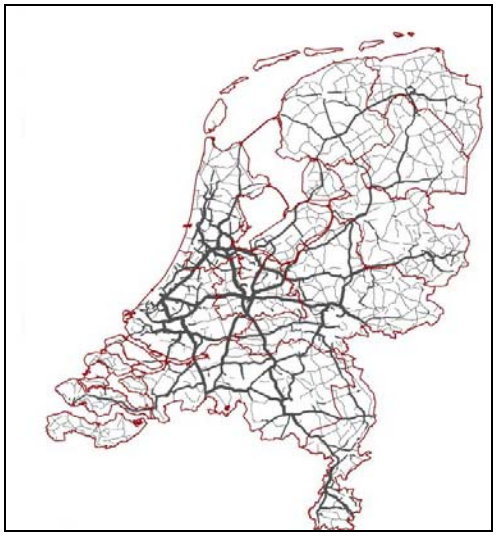

***Figure 2**: Intensity of traffic on roads by private cars on national and regional roads in 2004*

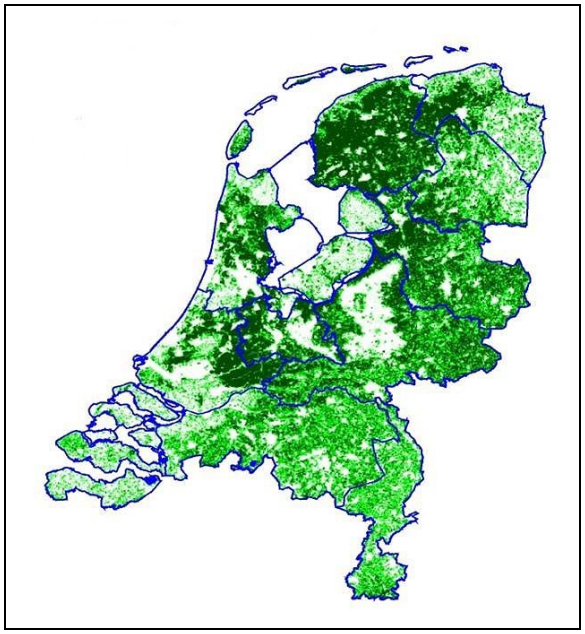

***Figure 3**: Agricultural grassland in the Netherlands*

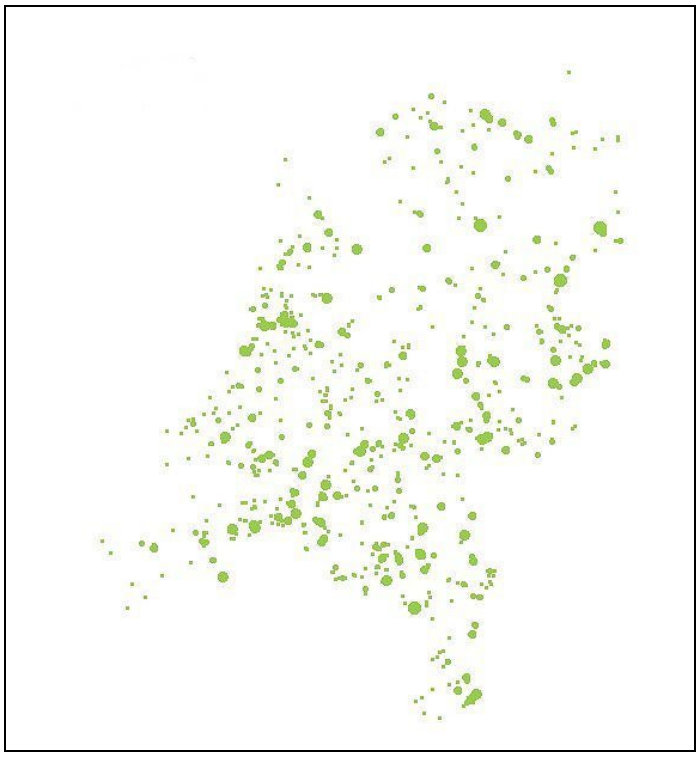

***Figure 4**: Division of employers working in the chemical industry to manufacture plastics*

Demand for emission data

National and international developments in the field of environmental policies, tend to the following developments in the PER system:

(1) PER to PRTR.

As described above, the PER system was set up to support environmental policy and – later on – to comply with international reporting requirements. So the focus of the PER system was primarily on data need from policy makers and scientists preparing models to support the policy making process.

A new perspective is the requirement to inform the public on emissions in their neighbourhood (and, by doing that, increasing the involvement of the public in the validation of emission data). This means that data should not only be available for experts / policy purposes, but also (in a condensed form) to the public. The range of data demand (at several levels of detail) has increased.

(2) Developments in international environmental policy

Both the UNFCCC and Kyoto Protocol added additional requirements to the inventory quality and the inventory preparation process. The inventory of greenhouse gas emissions should be *transparent, consistent, comparable, complete and accurate* (the so-called "TCCCA" criteria) as elaborated in the *UNFCCC Guidelines for reporting* (UNFCCC, 1999) and the *IPCC Good Practice Guidance* (IPCC, 2000). The national inventory system should comply to so-called National System guidelines

(UNFCCC, 2000), such as consideration of ways to improve the quality of the inventory, amongst others based on information from the review process (National System guidelines, articles 5(d) and 13 and 15 (d) (UNFCCC, 2000)).
The need for these strict requirements is based upon the fact that in the Kyoto Protocol flexible instruments (emissions trading) are introduced. Emission data need to be reliable; comparable; transparent in order to build up reliability in the system. Also the compliance system is rather strict in this context.

With a view on the achievements, there is a tendency in other international bodies to follow the example of the UNFCCC / Kyoto Protocol. In the context of the CLRTAP for instance, new reporting guidelines are under development. These guidelines will be more prescriptive than the old ones. They aim at improving the quality of reporting of Parties and to allow for better reviewing and stricter compliance provisions. One of the driving forces is the political attention for comparing the quality of emission data between Parties. By creating a "level playing field" in this context, the economic competitiveness will not be influenced by poor data quality.

(3) Developments in national environmental policy with respect to the PER
Emission data and reporting are important for evaluating environmental policy. Furthermore they are important for the Netherlands in order to comply with international reporting requirements – as described above. At the national level, the attention for (the quality of) emission data increases in two different ways. For climate change policy as well as air emissions, the Netherlands has defined policies and targets for the near future. Because these target years are near at hand and new targets have to be defined for the mid-term future, it's obvious that the attention of politics as well as target groups in the Netherlands for the quality of data increases. Relatively new is the increased attention of regional/local Governments for emission data calculated by the PER at a lower than national scale (provinces, local communities, waterboards, 5*5 km). Because of the ongoing economic development and the increased competition for (scarce) area in the Netherlands, the need of regional and local Governments for environmental data at their level increase. However, as indicated earlier, data presented on a lower than national level are only limited applicable for evaluation at a local or regional scale.

Supply of emission data
The demand for emission data, can be summarized as follows:

(1) There is a need to improve Quality Assurance/ Quality Control. Transparency, Completeness, Comparability, Consistency and Accuracy of the PER system has to improve because of (inter)national policy developments;
(2) There is a need to diversify the information for several user groups: more detailed information for professional users, international reporting. Less detail/ convenient information for the public;
(3) There is a need to diversify information at several spatial levels.

To be able to anticipate to these developments, the Netherlands has decided to build a new data system (also allowing to improve the efficiency of the data process). Figure 5 shows the data process according the new data system

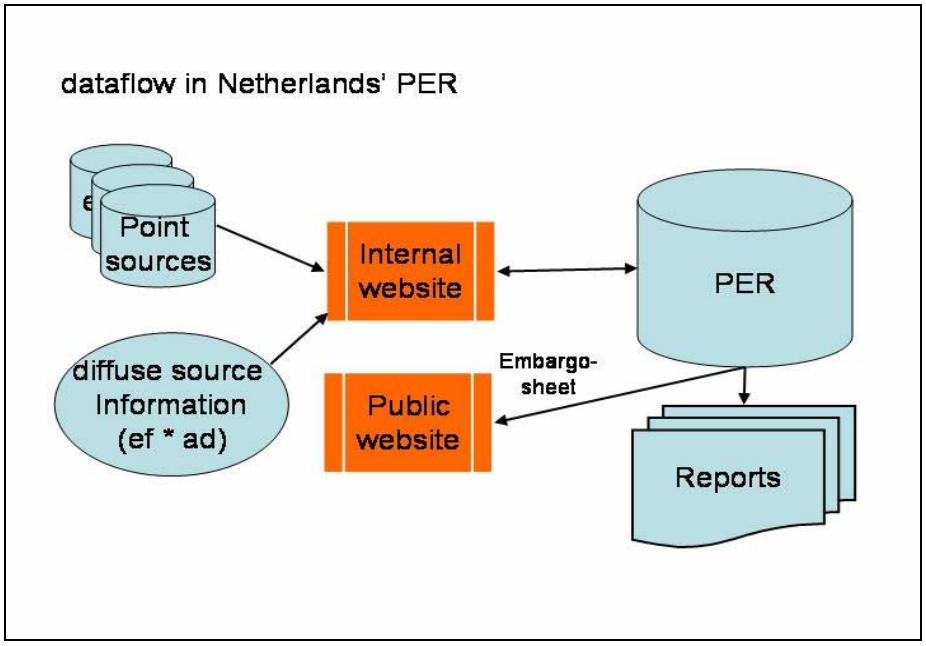

Figure 5*: data flow in the Netherlands PRTR. Source: Environmental Assessment Agency*

Main characteristics of the information system are:

- Microsoft Access databases (local)
- Oracle database (central)
- Microsoft .NET development environment
- ESRI ArcSDE, Oracle scheme with geodata
- ESRI ArcGIS for maintenance geodata
- ESRI ArcIMS for dynamic map production

The emission experts collect their national emission-data into an Access database with a strict format. With a web-based facility they can up- and download their data in the central database.(figure 6).
Geodata is collected in a separate Oracle (SDE) scheme. Among the datasets collected there are Intensity of traffic on roads, allocation of employees, allocation of households and their residents. Also specific point information of larger industrial sources are included separately, this data is gathered trough the Annual environmental reports (MJV).With a special tool overlays can be made and the results are stored in the central database. These results are used for allocation of emissions to several geographical units (provinces, 5x5 km grid, water boards etc).

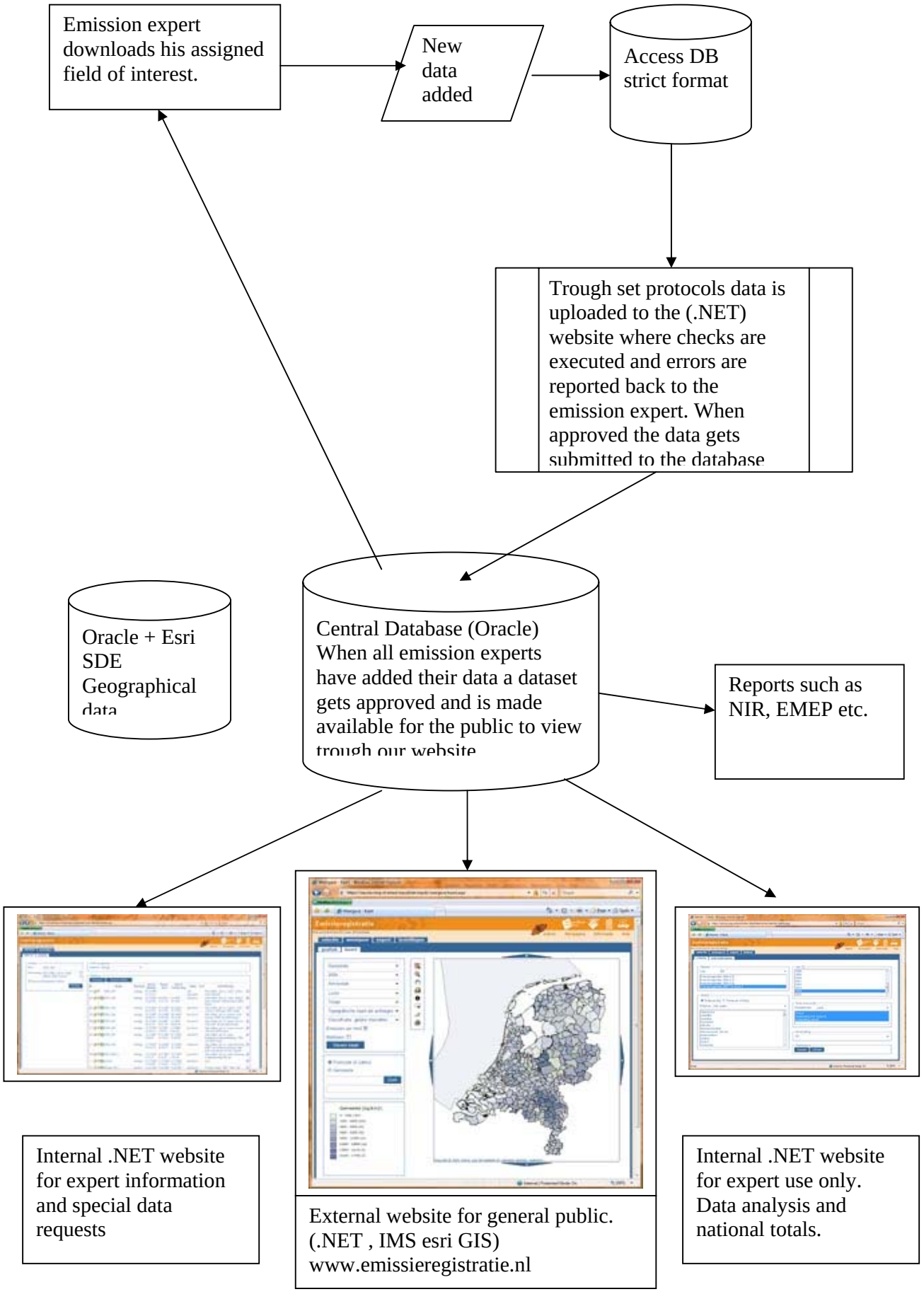

Figure 6. Flowchart of process of information gathering for PER**.**

The database contains emissions to air, water (direct and indirect) and soil for several datasets. With these data, and other referential data, it is possible to make all kinds of selections and combinations and calculate the desired emissions. The results are used for reports (such as National Inventory Report (NIR), EMEP etc) and as input for the public website.
Both websites provide information on emissions. The internal website shows all national emissions of all (historical) datasets. The public site contains data from the most recent dataset, including geographical calculated emissions. Both websites contain also information on used methodologies, published reports and background information on the published emissions (figure 7)

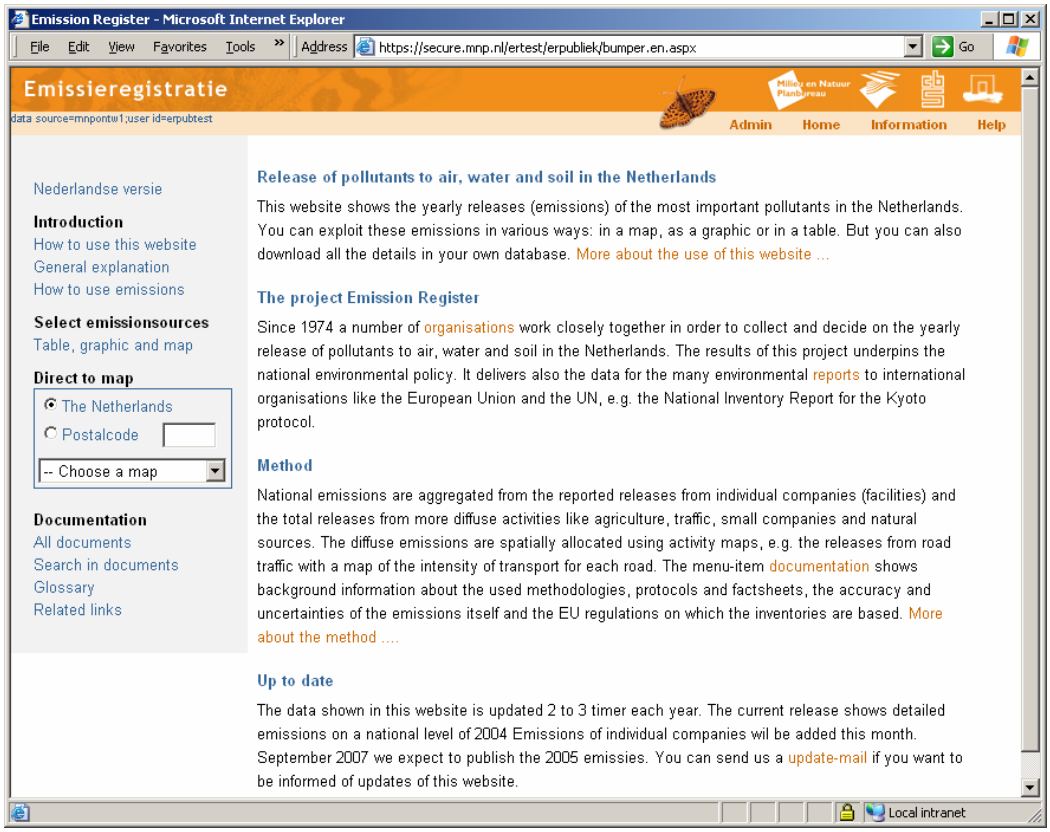

Figure 7 *the website of the Dutch PRTR. Source: Dutch PRTR, (2007) (www.emissieregistratie.nl)*

Below are some images that are output from our system. These images are displayed trough IMS on our public (.NET) website. This data is live zoom enabled and clickable for extra information. The chosen classes can be adapted to get the best possible result and explore the data to the fullest.

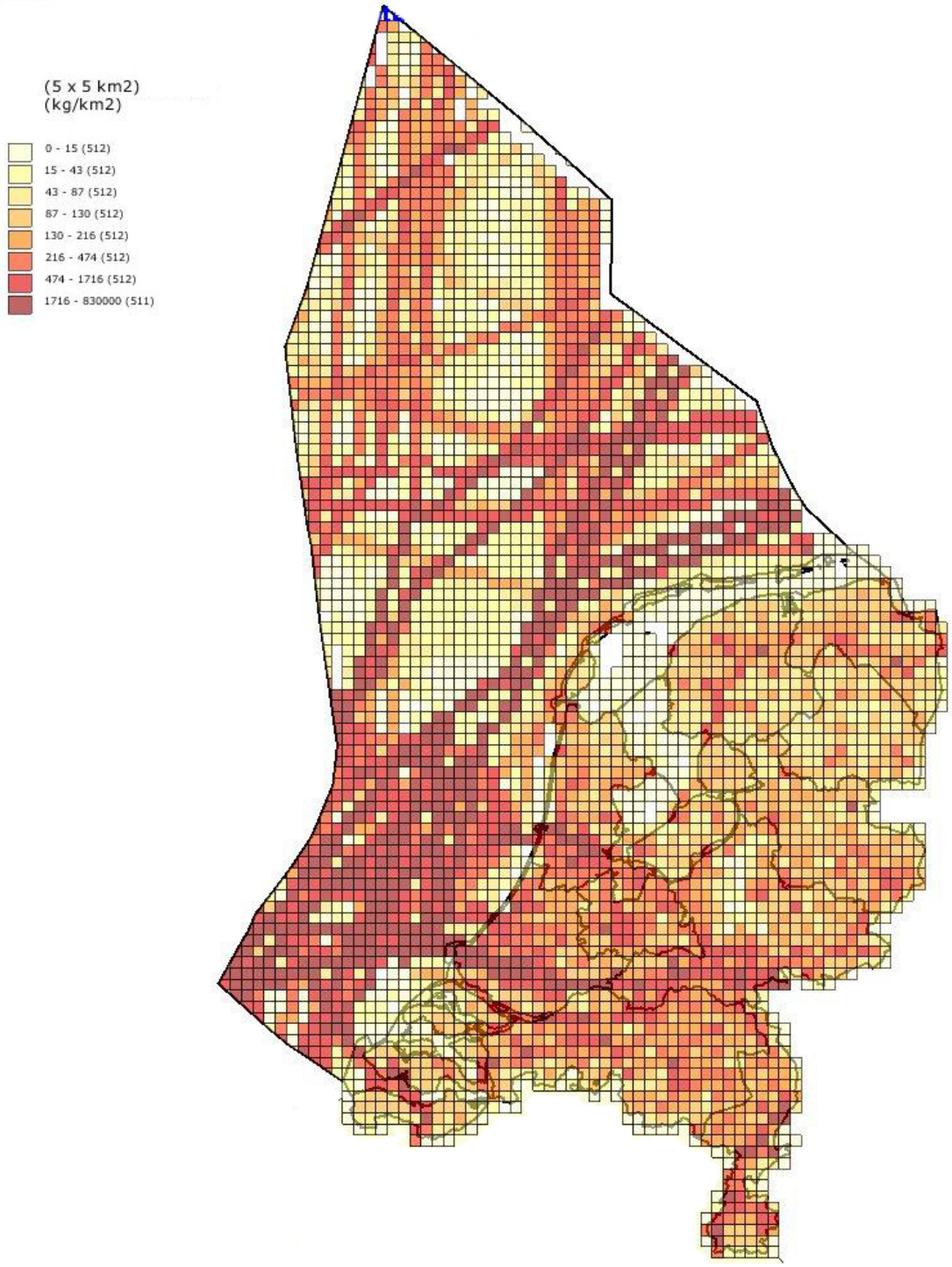

Figure 8 *SO2 Emissions to air per square of 5x5km in Kg per square km from all sources.*

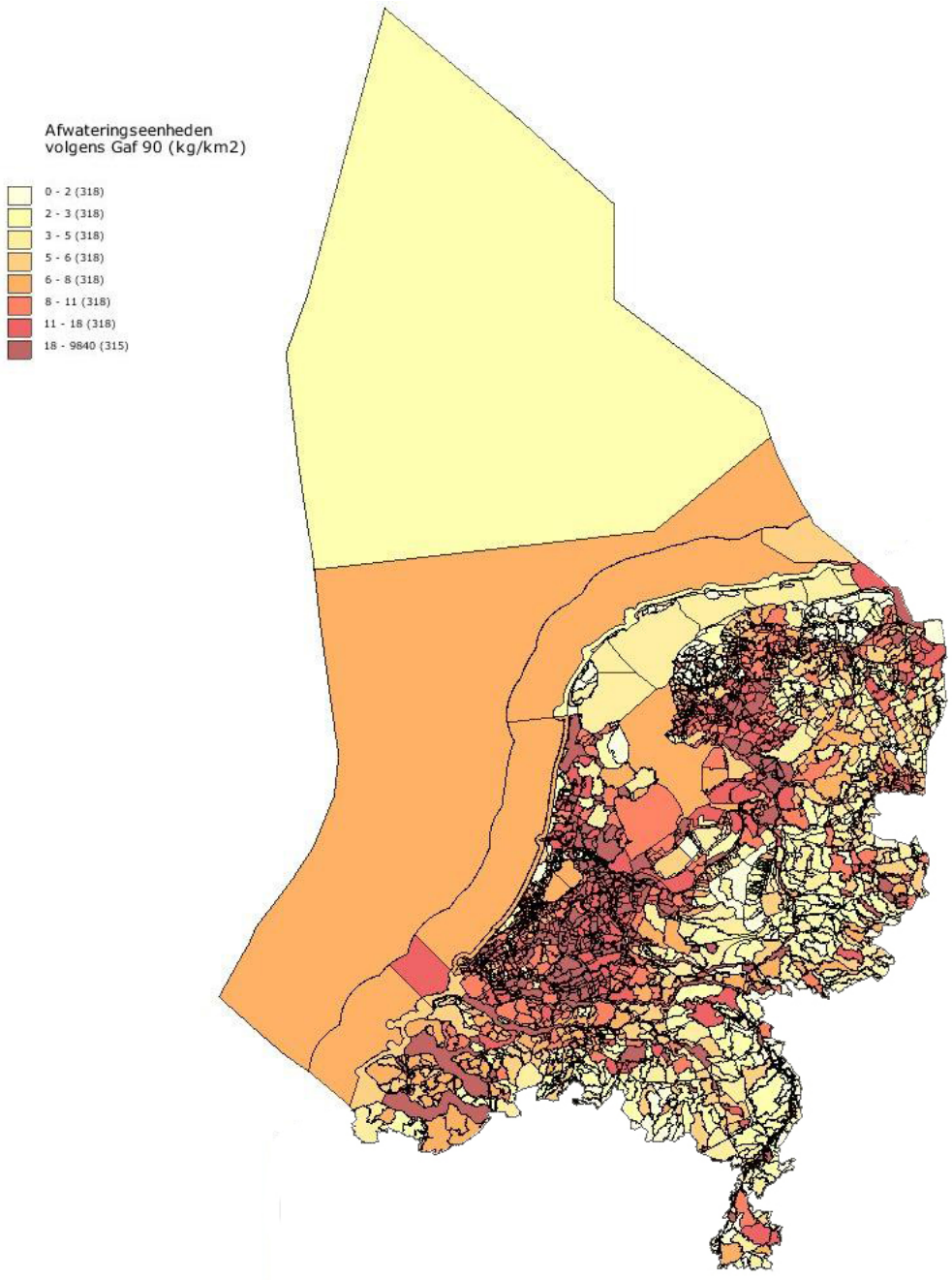

***Figure 9**: Zn Load to surface water for the Netherlands in 2004, aggregated by catchment areas in kg per square km.*

Concluding remarks

- In the context of developments in environmental policy and the related change in demand for information on emissions, the Dutch PER has developed a new data infrastructure, integrating emissions to air, water and soils on differentiated spatial levels. The level of detail shown in tables, maps and graphics can be differentiated according to the interests of the user;
- The way the new database is structured improves transparency in the data process as well as the underpinning of emission data. The new approach facilitates the QA/QC process of the Dutch PER. This is important because of increasing attention for QA/QC issues in international reporting obligations;
- The new website also contains information on large point sources. In this way, the Netherlands complies to the requirements of the PRTR protocol to make information on large point sources available to the public;
- Given the development of data need as presented in this paper, the infrastructure of the Netherlands PER system is flexible and able to provide information to different data users in an efficient way. In that sense, the PER may fulfill it's aim contribute to an effective environmental policy in the Netherlands in the years to come

Literature

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Oracle
PRTR