Cost guide for implementation of the UNECE Protocol on Pollutant Release and Transfer Registers

Introduction

This paper addresses the costs of implementing the Protocol on Pollutant Release and Transfer Registers (PRTRs) of the UN/ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the Aarhus Convention). A PRTR records information on releases to the environment and transfers of potentially hazardous chemicals.[1]

The accompanying spreadsheet model aims to cost implementation of the Aarhus Convention Protocol (ACP) for its 36 UN/ECE signatories, as well as for prospective Signatories to the ACP. The model has been designed flexibly to rely on user-entered data inputs for non UN/ECE member states that may at some point in the future want to sign up to the ACP, in order to yield cost estimates for those countries.

A precursor study, entitled *Analysis of Costs and Benefits of Pollutant Release and Transfer Registers*, published as UN document CEP/WG.5/AC.2/2002/4, qualitatively assessed possible benefits of PRTRs to various stakeholders and undertook a first quantitative estimate of costs associated with a PRTR instrument. In line with its terms of reference[2], that study sought to provide 'objective information on the costs of PRTRs, borne by the various stakeholders' and to 'distinguish different scenarios, which correspond as much as possible to choices still to be made by the negotiating parties', including 'distinguishing initial set-up costs from incremental costs arising from expansion of the PRTR through the inclusion of additional reportable chemicals, reporting activities, release or transfer pathways' [p.53].

The current analysis adapts the model previously developed in order to encompass the actual parameters of the ACP on PRTRs (which were still under negotiation at the time of the precursor study). The new model is more refined in its scope and is therefore capable of overcoming some of the drawbacks of the previous model. First, it is based on the negotiated outcome of the ACP and, therefore, no longer needs to rely on the selection of a small number of simplified scenarios for developing PRTRs drawn from a theoretically enormous array of permutations. Second, it uses a country-by-country approach and, thus, the substantial regional and economic disparities which were only crudely captured through the division of the region

[1] For more information, see Art. 4 of the ACP detailing core elements of a PRTR system. See also UNITAR (1997), Implementing a National PRTR Design Project: a guidance document, UNITAR Guidance Series for Implementing a National PRTR Design Project, July.

[2] Given in Appendix A of CEP/WG.5/AC.2/2001/10.

into three economic subregions in the previous model can be better taken into account. Third, due to its country-by-country approach, it conducts a comprehensive assessment of countries' existing legal, regulatory, institutional, administrative and technical infrastructure relevant to PRTRs, thereby overcoming the difficulty of defining a valid, generic 'baseline' – in terms of the pre-existing regulatory framework – for all countries.

The in-depth revision of the original study allows for more accurate country-specific conclusions to be drawn from the model, thereby enhancing its value to Parties and prospective Parties to the ACP and the international community at large.

The paper is structured as follows. Section II sets out the detailed methodology for the 'theoretical' model and defines its scope. In Section III, the data inputs and sources are discussed which define the empirical part of the model. The costs of implementating the ACP vary from country to country, not least because countries across the UN/ECE region have different starting points. Therefore, to assess countries' different starting points and their impacts on the modelling methodology, the section also reviews the status of existing national PRTR programmes in the UN/ECE region and the multilateral environmental agreements that cover some of the substances on the ACP list and to which UN/ECE member states are signatories. Section IV analyses the results of the calibrated model and, finally, Section V concludes.

Theoretical model

Introduction

This section sets out the methodology developed to cost the ACP. The model calculates costs of implementing the ACP for both UN/ECE member states that are Signatories to the ACP and those that are not.[3] It is expected that many ACP Signatories will be interested in both the costs of implementation[4] and, especially, in the costs of possible expansions to the current ACP framework. On the other hand, other UN/ECE member states that have not yet signed up to the ACP will arguably be most interested in just the ACP implementation costs.

ACP stakeholders and their related actions

Integral to the costs of implementing the ACP at the individual country-level are the relevant stakeholders and their related actions, which are described in detail in the recent Guidance Document.[5] There are three stakeholders, civil society, governments and industry, each with an important role to play in the ACP process.[6] The focus of this paper is on the latter two, as these have legal mandates developed by the ACP.

Industry

The lion's share of the costs of implementing the ACP appears to fall on participating facilities, especially in order to collect the data to be submitted under the ACP. Facilities' costs relate to fulfilling their reporting obligations under the ACP, detailed in Art. 7. These refer to both emissions (substance releases to air, water and land from point sources) and off-site transfers of waste.

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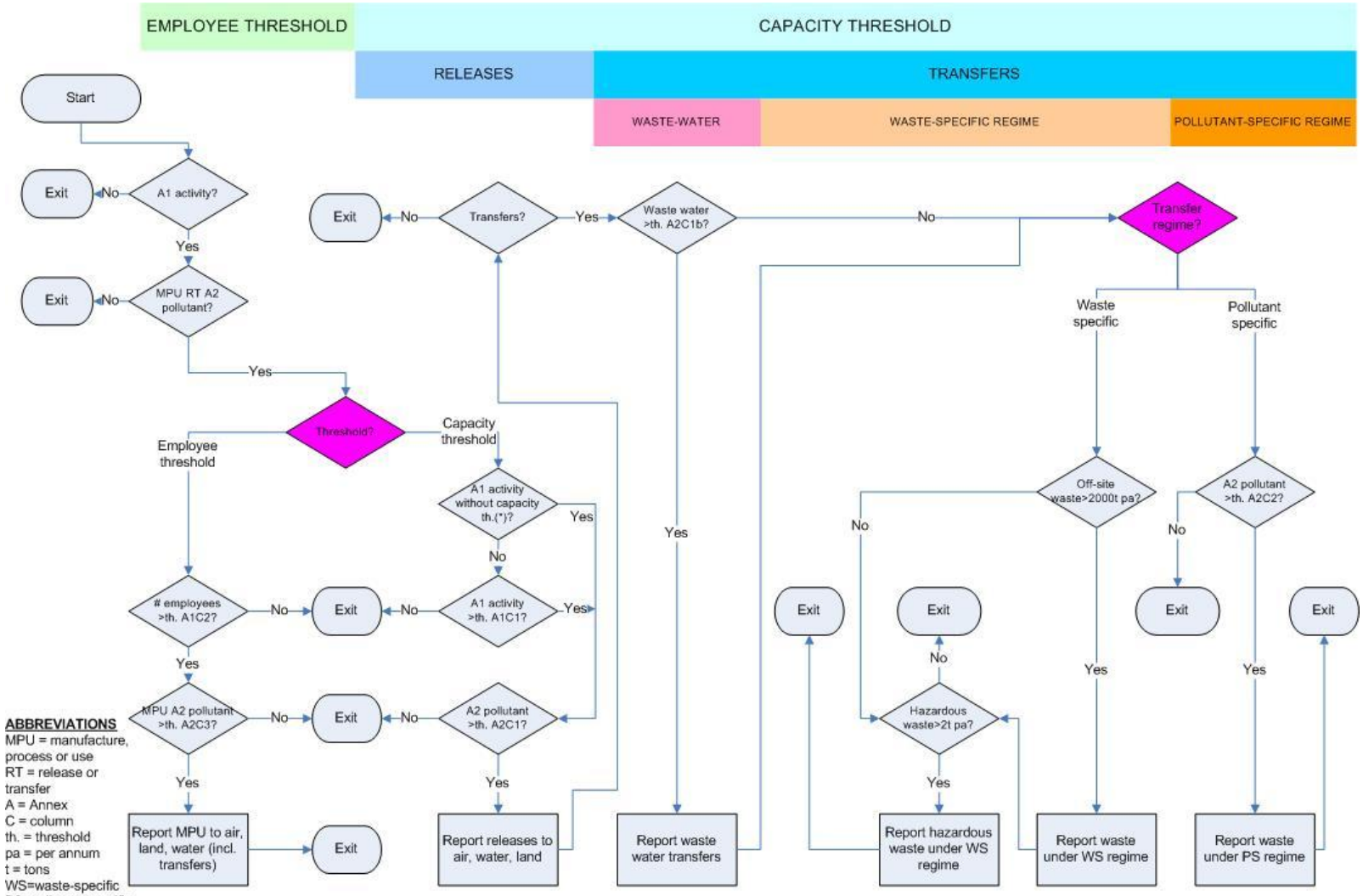
[3] In addition, as mentioned above, the model can also be used for non-UN/ECE member states that may become future Signatories, provided the user can enter the relevant model inputs.

[4] This may be the case for poorer countries in this group which may reasonably be expected to be helped in their implementation of the ACP through aid money and/or technical assistance.

[5] See also Guidance Document for Implementation of the UNECE Protocol on Pollutant Release and Transfer Registers: complete final draft for Virtual Classroom, prepared by consultants TNO-MEP and Milieu.

[6] Stakeholders are identified in Annex II of the report of the first meeting of the Aarhus Convention Task Force on PRTRs (CEP/WG.5/2000/5, paragraphs 85-88).



The above Figure gives an overview of facilities' reporting requirements. Only facilities that are active in one of the specified ACP Annex 1 activities and that manufacture, process, use, release or transfer a substance listed in ACP Annex 2 may need to report, depending on whether or not they exceed the specified thresholds.

Facilities' exact reporting requirements in a particular country are governed by whether the government has opted for an employee- or a capacity-threshold and, in the the case of off-site transfers, for a waste-specific or pollutant-specific regime.

Under an employee threshold approach, only facilities that surpass the employee threshold given in ACP Annex 1 (column 2) and that manufacture, process or use an Annex 2 substance that exceeds the threshold specified in ACP Annex 2 (column 3) need report their releases and transfers under the ACP.[7]

Under a capacity threshold, facilities that surpass the activity thresholds in ACP Annex 1 (column 1) and the substance thresholds given in ACP Annex 2 (column 1) must report substance emissions to the three media, air, water or land. Off-site transfers also need to be reported if they exceed the thresholds given in the ACP. Discharges that surpass the relevant threshold in ACP Annex 2 (column 1b) must be reported. For facilities under a pollutant-specific regime, waste transfers that exceed substance thresholds given in ACP Annex 2 (column 2) are required to report these, while those bound by a waste-specific transfer regime are obligated to report normal waste transfers that exceed 2000t per annum or hazardous waste transfers that exceed 2t per annum.

The costs, including staff time, associated with PRTR reporting include:

- understanding reporting requirements and determining whether the facility is required to report;
- identifying required data and how they can be obtained;
- obtaining data by contacting vendors, performing calculations or carrying out monitoring;
- completing the reporting forms;
- setting up an internal system to track data from year-to-year;
- providing in-house training for any of these tasks; and
- obtaining software and/or hardware.

[7] The employee threshold refers to the equivalent of a full-time employee, defined as 2000 man hours per annum.

Facilities often lack knowledge of what substances they are using and releasing. Pilot studies suggest that larger facilities usually know how to collect data but find the necessary co-ordination among internal operating groups in order to compile the data challenging. Smaller companies initially are not sure how to collect the relevant data on emissions and lack appropriate expertise and specific knowledge about how to obtain data and keep records.[8] Larger companies may already collect certain types of information, e.g. process control or worker exposure data that can be used to estimate PRTR data. The costs involved to report PRTR data then centre around the cost of co-ordinating and compiling the data scattered around the company. These companies have often purchased software to develop more comprehensive inventory and management systems. Consulting firms, engineering firms, insurance providers, and others provide software record-keeping services to assist facilities in setting up such systems. Once record-keeping and data management systems are developed, these are frequently used by the facility for other purposes.[9] One approach facilities have used to keep costs manageable is to first estimate releases and then select specific areas in which to monitor actual releases. This allows facilities (using such a phased approach) to improve accuracy of their estimates at a reasonable cost. Governments are increasingly designing PRTRs so that reporting can be done electronically and in a way that is compatible with other software.[10] By contrast, SMEs will typically have costs to acquire and obtain data.

The first steps for facilities towards fulfilling the reporting requirements usually involve completing material safety sheets, checking purchasing and vending order and collecting data on production and manufacturing usage. Once a system is in place, the reporting requirements were found not to be 'particularly difficult' to fulfil. Usually, a person within a facility is appointed to manage PRTR reporting, usually somebody in charge of either environmental compliance or waste management, materials purchasing or production or operations management.

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[8] See UNITAR (1997), Addressing Industry Concerns…..

[9] For example, many companies find that the costs are partially offset by benefits which go beyond the improvement of systems for tracking chemicals, e.g. NJDEP (1995), Early Findings of Pollution Prevention Program, NJ Department of Environmental Protection, Office of Pollution Prevention, March 1995, estimate that for every dollar spent on planning for source reduction initiatives, facilities save five to eight dollars by implementing such projects. PRTR data has also proved useful to general efficiency. For example, 83% of Minnesota facilities used TRI to analyse processes and operations, possibly leading to efficiency gains. See Kiesling, Frances (1994), Minnesota Pollution Prevention Planning Survey – results and technical report, Minnesota Office of Waste Management, March 1994, Technical Report no. 94-3.

[10] For example, Environment Canada uses NPRI reporting form, which is similar to the CCPA annual reporting form. In the US, a computerised form for TRI reporting is easy to use and facilitates the reporting process.

There are essentially three ways to determine releases, namely, measurement, calculation or estimation. Measurement of emissions is based on actually monitoring a given substance for the process in question, at the operators' plant and via a given discharge route. This can include continuous measurement by the plant operator, short-term or spot measurements by the plant operator or short-term or spot measurements by contractors or the environmental agency. It is clear that continuous emission monitoring will yield the most accurate result to quantify releases of a given substance via a given route. However, only rarely will sufficient data be available for all emission points to enable the annual total release of a substance to be quantified exclusively by measurement without resorting to other techniques.

Calculation uses specific data from the operator's plant, based on a mass-balance approach or by using emission factors derived from similar plants with similar processes on the operator's site. Mass-balance calculations may be performed over a year or extrapolated from a smaller period of time. They provide reliable estimates of releases based on records of the quantity of a substance entering and leaving a process. The general equation for mass-balance is:

Total substance available (in stores at the beginning of the period plus the amount purchased over that period) plus substance generated (or actually manufactured at the facility)

= substance released (via product, as waste or as emission) + amount of substance converted (into another substance)

= amount of available substance left (in stores at the end of that period)

Finally estimation is based on more generic data, derived from similar plant or processes. The quality of estimated emissions data can vary widely. In some cases, emission factors – average values which describe the quantity of a chemical released as a function of a specific process or the method of use of equipment[11] – have been calculated from measurements under test conditions on different types of equipment. Sometimes, estimation is based on average releases from similar types of processes. Emission factors can be plant- or process-specific but may also be national averages.

[11] Emission factors can be expressed a s ratio of substance released to amount of chemical through put.

Industry-specific guidance issued by the US Environment Protection Agency (EPA) calls for measured data to be collected when available and to use mass-balance or engineering estimates when measured data is not available. It is important to consider all routes of fugitive emissions. Sometimes all three are used to determine annual discharges of a substance.

Bottom-up methodology

The theoretical model built to cost the ACP is of a bottom-up variety, meaning that it uses a method for estimating the cost of the complete project by combining estimates for each individual component. The theoretical model is set out mathematically in Annex {} and its key features are described here.[12]

Costs to each of the two stakeholders – facilities and the government – are estimated separately. There are two components that make up total costs to each stakeholder, namely, quantities and unit costs.

Industry

Unit costs for facilities encompass {mainly} labour costs of different staff types involved in performing the ACP-mandated actions. Four staff types are assumed for each facility, each commanding a different gross annual salary and different overhead costs. The gross annual salary of each staff type is adjusted for employee benefits and overhead costs (both as a percent of salary) to obtain a loaded salary figure. These quantities all vary across the two periods of the basic model and across countries.

At the facility level, each staff type works a different number of hours to perform mandated tasks which are assumed not to vary across country but can vary across time period. The underlying assumption is that employees have the same productivity across countries in performing ACP related tasks.[13] Tasks for the four staff types are split into so-called initial and final actions, both assumed to be unrelated to (independent from) substances released or transferred by the facility to various media. Initial actions relate to actions to assess whether that facility is required to report under the ACP, as specified by Art.7 [ACP], while final actions include co-ordinating data collection across the facility, inputting relevant data and submitting reporting forms to the authorities. In addition, facility

[12] It is necessary to distinguish the theoretical from the empirical model. The theoretical model has a wider and more sophisticated scope, in terms of the level of detail it can handle. By contrast, the empirical model depends on the quality and depth of data inputs that can be collected across the large number of countries under study. Where informational gaps exist, the empirical model therefore makes simplying assumptions.

[13] Or, to put it another way, the model will estimate what are deemed to be reasonable costs for a country implementing the ACP.

staff performs measurement, calculation and estimation actions which differ across substances released or transferred by a particular facility. As mentioned above, facilities' reporting requirements differ depending on which type of threshold and possible transfer regimes they come under and, hence, the model differentiates costs associated with these different regimes.

At the country-level, the model attempts to quantify only the incremental costs of the ACP for each country. Countries will be at very different starting points once the ACP enters into force. Some will have to implement a PRTR *de novo*, while other already have commitments under an existing national PRTR, a licensing regime or under an international MEA to monitor the given substance. Costs will vary substantially depending on a given country's starting point or baseline. For example, countries starting *de novo* would have to review the obligations under the ACP and to determine whether existing institutions and systems are adequate for performing the various obligations. Countries that already have substantial national operating permits or monitoring systems in place would have to review their existing systems to monitor and register emissions, including how this information currently flows among the various institutions. According to the Guidance Document, some new EU Member States, as well as Balkan and EECCA countries are currently restructuring their national systems {get more info on this from consultants}.

Many UN/ECE countries have signed up to a number of international legal instruments that require them to limit or phase out certain substances that also form part of the ACP substances list, given in Annex II of the Protocol. This implies that, for those substances, some actions are already being taken at the national level in terms of quantifying their emissions, as most of the relevant multilateral environmental agreements (MEAs) have already entered into force. These will be reviewed in the empirical section of the paper on a country-by-country and substance-by-substance basis.

The model subtracts the costs associated with specific substances that are already monitored by facilities in a given country. For example, a country implementing the ACP that already has a working national PRTR which covers fifty of the 86 ACP substances would only need its facilities to report on the additional 36 substances in order to fulfill its ACP obligations. The model would then calculate the cost of reporting on the additional 36 substances.

In the case of an overlap with a national PRTR or a licensing scheme, this approach is likely to closely proxy reality and hence would be a good assumption to use to distinguish countries' starting points. However, in the case of an overlap with an international legal obligation, it may be a worse proxy of reality. This is because an international legal obligation to monitor or reduce a substance could entail either a once-off aggregate calculation of emissions based on broad emissions factors and performed by the government (in which case, upon entry into force of the ACP, costs would be imposed on that facility to monitor that

substance) or it may entail facility-based actions to measure, calculate or estimate that substance and report this to the authorities charged with implementing the MEA (in which case, there would be few or no additional costs for implementing the ACP related to that particular substance).

In order to aggregate the costs across facilities within a given country, a number of assumptions are made. The model begins by mapping the ACP activities list into ISIC industrial classification of economic activities.[14] It then maps these economic activities into substances released to the three media, air, water and land or transferred as waste water, waste (pollutant-specific regime), waste (waste-specific regime) and hazardous waste (waste-specific regime). The underlying assumption is that all facilities in that particular activity all produce the substances specified as releases or transfers. This assumption is taken to hold across countries. Next, it takes the number of facilities operating in a particular activity (in a given country) and multiplies this by the cost estimate for complying with the ACP in that particular activity, which, as described above, has both a substance-specific (measurement, calculation, estimation actions) component and one which does not depend on the substances monitored (initial and final actions). One underlying assumption here is that facilities only operate in one ACP activity, for example, their main area of activity.

[14] The full list is given in http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27&Lg=1.

Empirical model

Data sources

Dun & Bradstreet collects data across the industrial sector, which can be used to identify facilities that might be subject to reporting requirements, namely those employing more than nine employees.

Status of national Pollutant Release and Transfer Registers

Introduction

A number of countries in the UN/ECE have ongoing national PRTR programmes or are in the process of establishing these.

National PRTRs differ in their design, e.g. in Canada and the US, companies report on those listed substances for which their use exceeds a specified minimum quantity. However, the Canadian system is based on the presumption that all sources must report other than those specifically exempted from this requirement. The US and UK systems lists industrial sectors that are included, while the Norwegian system does not specify industries.

{See UNITAR: Implementing a national PRTR Design Project, pp. 11- 14 + Pietro's notes}

A wide analysis of existing national PRTRs (*Pollutant Release and Transfer Registers*) has been held. The duration of this phase was two weeks: such a duration was required in order to have a satisfactory (complete) overview of existing PRTRs in different countries in the world[15].

In this way the modelling team – in charge of costing the implementation of the PRTR proposed by the Aarhus Convention Protocol[16] – will be able to:

Understand the starting point – and the related cost – for the future implementation of the Aarhus PRTR in each ECE member country;

Foresee possible future developments[1] in the list of pollutants to be monitored by the Aarhus PRTR and in the related thresholds (as for the thresholds, changes are not likely to happen (see paragraph below)).

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[15] Since suggestions for improving one specific national PRTR are usually given by analyzing what other countries do, we took into consideration major national implementations all over the world, even though they are not ECE member countries: so, we are able to have an idea of what modifications in the present Aarhus PRTR could be possible in the future

[16] This register will be later called simply Aarhus PRTR

The North American Commission for Environmental Cooperation (CEC) that is trying to standardize certain aspects of national registers in the USA, Canada and Mexico, in order to make the registers in the three North American countries comparable among them. Furthermore, combining data from the USA and Canada into its annual *Taking Stock* report, the CEC has been able to give a regional picture of the reductions over time in the 165 chemical pollutants common to both national reporting systems;

The Regional Environmental Center for Central and Eastern Europe (REC), that has organised workshops to promote the implementation of national registers.

Major national PRTRs were analyzed and they are here reported in such an order that the first ones described are the ones that are the closest to the Aarhus PRTR and the last ones are the furthest from the Aarhus one as for pollutants included and respective thresholds.

This arrangement has been chosen in order to be able to select which registers might be considered to improve the Aarhus PRTR: in fact, the closer the national register to the Aarhus one, the easier to import some inputs from that into the Aarhus one.

A potential benchmark for an improvement of the pollutants included in the Aarhus PRTR is likely to be the European PRTR; other comparisons and extensions might be done with the Canadian, the Japanese and the POPs systems. As for the pollutants thresholds, they are likely to be decreased for new pollutants and there is no debate to change the thresholds of the existing pollutants (**Stanley-Jones, 2005**).

In each register the pollutants to be monitored and their thresholds into every kind of media (air, water, soil, waste, product, off-site transfer, ...) have been pointed out.

The Norwegian national system (INKOSYS)

Norway has always been among the most advanced European countries as for innovative environmental issues: this is the main reason why the Norwegian Pollution Control Authority (SFT) – a directorate under the Ministry of the Environment – has bilateral co-operation with a number of developing countries where institutional strengthening and pollution control are key subjects.

The national system, INKOSYS, was introduced in 1978 as an internal non-standardized polluter-based tool for the authorities and upgraded in 1992. Therefore, data from 1978 to 1991 are available for each polluter but they are mainly useless because they cannot be compared as the kind of information gathered differs

from polluter to polluter (each polluter (mainly facility) decided what and how to report its data on pollution to the INKOSYS). A list of priority substances whose emissions were to be reduced by 2000, 2005 and 2010 was published in 1997 and then updated in 2002-2003.

The Norwegian *Pollution Control Act* (dating back to 1981 and most recently amended in 2003) (website) defines pollution as follows in its Article 6:

Introduction of solids, liquids or gases into air, water or ground (this is the definition we are mainly interested in as for our project of costing the implementation of the Aarhus PRTR);

Noise and vibrations;

Light and other radiation to the extent decided by the pollution control inventory;

Effects on temperature.

All these four are to be regarded as causes of damage or nuisance to the environment.

Article 7 of the same Act prohibits industrial pollution: it states that "no person may possess, do or initiate anything that may entail a risk of pollution", with the exceptions pointed out by Articles 8, 9 and 11. Any person (mainly companies) that may cause pollution (polluter) (in one of the definitions above) has to apply for a permit that states different aspects (pollutant reporting thresholds, etc.). The licensing procedure is public. The number of operative permits was 643 in September 2004. In this way, every pollutant produced has to be reported to the government – and specifically to the SFT.

According to specific criteria (website), the SFT published an updated list of priority substances (website) whose emissions are to be reduced by 2000 and – if possible – eliminated by 2005. This list needs to be constantly updated because some of the priority substances now included are still in use for certain purposes and some sources of emissions have not been eliminated. In addition, contamination and waste from earlier activities can still create pollution problems today. Further measures will therefore be implemented to reduce or phase out emissions of these substances. Among all priority substances, some of them are totally prohibited: as for these pollutants, no exceptions are usually granted in the permits given to each polluter.

The pollutants to be reported to the Norwegian PRTR include all the Aarhus ones but Norway is focusing its attention on other more recent substances that are polluting its environment.

The media that the INKOSYS uses are air, water, land and waste: all pollutants are to be checked for each of the media.

There is a remarkable difference in the approach used by the Aarhus Protocol and the SFT in setting the reporting thresholds: in the Aarhus PRTR reporting thresholds are fixed by the Protocol; in the INKOSYS, instead, the reporting limits are decided for each license the SFT grants, event though they are not likely to differ for the same pollutant from one license to another; in fact, in order to set them, the SFT uses best practises that derive from its previous experience or from regulations of the EPER, the future European PRTR, the OSPAR or the Norwegian Ministry of Environment.
It has to be remarked that certain aspects of the existing Norwegian PRTR will be changed in the near future. Apart from the routine revisions (e.g. the list of priority substances), the main one will consist of the possibility for the polluters to report electronically their data via the Internet: this will increase the accuracy of the figures reported, because it will avoid potential modifications of the data while dealing with them.

The Swedish KUR
Sweden has always been so an advanced country as for environmental issues as Norway.
The Environmental Protection Agency was appointed by the Swedish government to investigate the best way in which information on the use and emissions of chemical substances could be made available to the public, trying also to comply with international agreements entered into by Sweden. In its report to the government the Agency expressed its intention to implement a register of emissions generated by Swedish facilities (KUR website). An *Ordinance concerning Environmentally Hazardous Activities and The Protection of Public Health* was issued in 1998 and revised for the last time in 2002 (Ordinance).
The PRTR register contains 70 substances/groups of substances in total. The selection is based on the requirements of the EPER reporting and the substances prioritized by OSPAR in 2000 as substances of concern (KUR website). Therefore, the list of pollutants included is likely to change in order for Sweden to comply with the future European PRTR that is going to replace the existing EPER. Most of the pollutants included in the Aarhus PRTR are covered by the KUR, which includes few other substances not included in the Aarhus system. For all substances, the thresholds seem to be very well thought and specific for each of them in both media considered (this is particularly evident for the metals where each pollutant has a specific reporting limit generally different from the one of another metallic substance): in fact, they are not divided into different categories and given a unique threshold to the whole category.
Two are the highlights of the Swedish PRTR. Firstly, in its reporting requirements it has got a feature similar to the Norwegian system: each activity that produces any quantity above the threshold of the pollutants included in the KUR list must apply for a permit in accordance with the stipulations of the Swedish

Environment Code (Ordinance); the difference with the Norwegian system is that the KUR has thresholds for each pollutant that are fixed and so they do not depend on each permit issued.

The second characteristic that makes the Swedish system special in its structure is the kind of media for the releases: apart from air, water and waste, the KUR has introduced a new one: product. In fact, many were the facilities that used to avoid reporting by including pollutants in their products: in order to control, monitor – and try and stop – this habit, The Environmental Protection Agency added products in the list of media by which hazardous substances can be produced. This strategy can be easily adopted by other PRTRs, if it is proved to improve the environment monitored.

British Chemical Release Inventory

The UK's Chemical Release Inventory requires reporting by facilities under its integrated pollution control system. Thus, UK facilities' reporting is congruent with sites and pollutants controlled in permits. This means that obtaining data under this system is less of an issue because companies use the same data to demonstrate compliance under the national integrated permitting system. Data are entered into registers by government inspectors.

Apart from the two Scandinavian systems just analyzed, also the different agencies in the UK have always been prompt to implement up-to-date systems according to the national and international needs and legislations.

A Bill of the House of Commons (Bill) dating back to 1999 pointed out in its Article 5 – about Public Access to the Register – the relevant agencies in order to extend "the right of citizens to information concerning certain activities which may affect the environment":

In respect of England and Wales, the Environment Agency, which has created the Pollution Inventory (PI);

In respect of Scotland, the Scottish Environment Protection Agency (SEPA), that developed the Scottish Pollutant Release Inventory (SPRI);

In respect of Northern Ireland, the Department Of the Environment (Northern Ireland) (DOE) and specifically the Environment and Heritage Service.

Even though different agencies were identified, each party and each PRTR use the same reporting criteria (pollutants and related thresholds, media) and data collected are used for the same destinations (National Atmospheric Emission Inventory (NAEI), that gathers data about air releases, and the EPER). Great Britain has very well thought and specific thresholds for each substance in each media. UK also has a unique voice in the Aarhus Convention's working groups on PRTRs represented by The Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA).

What distinguishes the UK is that only water and air releases are monitored by the registers. Most pollutants included in the Aarhus PRTR are monitored by the British systems, too; the ones in the United Kingdom include also many other substances that are not monitored by the Aarhus Protocol. This is the main reason why the British PRTRs can be regarded as really in line with present and up-to-date information about the pollutants to be monitored.

Another special feature about the British systems are the specific criteria – supported by flow chart analysis – they set especially in the English-Welsh PI to introduce new pollutants and pollutant reporting thresholds and to change them.

In 2002 there was a consistent change in the pollutants included in the PI, mainly for releases into water; many substances were removed for three main reasons (see PI documents):

Not reported in significant quantities on the PI;

Substance not a priority for inclusion according to criteria for substances;

Substituted by another substance or substance group on the reporting form.

Overall the number of PI substances reported to air changed from 114 to 129 (this does not include substances reported to the Large Combustion Plant Directive) and the ones reported to water varied from 65 to 77.

Also the reporting thresholds were reviewed (some of them were increased or decreased) in 2002 according to nine rules pointed out in page 12 of the document on the PI.

In respect of Scotland, the SPRI – 2004 reporting form replaces the EPER data return form for Scotland used in 2002: reporting parties will not receive a separate form for EPER information, because the Scottish system is more strict than the EPER in terms of pollutants monitored and reporting thresholds (see discussion in the next lines). The new form contains an updated list of substances and should be used for reporting emissions which occur during 2004. While the list for air has remained unchanged in comparison with the Aarhus Convention, the list for water has expanded to include substances of concern to the Water Framework Directive.

The SPRI pollutant thresholds may differ from those within the EPER Discussion. This is because the SPRI aims at restricting the burden of monitoring and reporting for industry (see documents on SPRI).

In order to seek consistency with the equivalent reporting requirements in England and Wales and in preparation for the expanded reporting requirements of the Aarhus PRTR, the first review of the SPRI will be carried out in 2005 at the same time as the Environment Agency of England and Wales review their PI (see documents on SPRI).

European Pollutant Emission Register/PRTR

Concurrently to developments surrounding the ACP, the European Union adopted its own system, the European Pollutant Emission Register (EPER). This instrument was created in the context of the Integrated Pollution Prevention and Control Directive (IPPC Directive), a key piece of environmental legislation that establishes an EU-wide integrated permitting system. There is considerable overlap between the ACP and EPER, including their similar structure, however in terms of substances and economic activities covered, EPER is more of a subset of the ACP. Thus, although both have in common coverage of economic activities such as energy, metal, mineral and chemical industries and waste management, EPER covers fewer polluting activities and much fewer substances. Also, it does not include provisions for off-site transfers of waste, for releases to land and for diffuse sources. However, as the EC is a signatory to the ACP, EPER is set to be upgraded to a European PRTR (E-PRTR) that will meet the provisions of the ACP.

United States Toxics Release Inventory

The distance between Europe and North America can be perceived also while having a look at the structure and the content of pollution registers used in the two regions. Registers in North America include many more pollutants than the number contained in the Aarhus PRTR and the average number in the PRTRs used in Europe – and especially the EPER or the European PRTR.

As we have already mentioned in the introductory part of this survey, the North American Commission for Environmental Cooperation (CEC) is trying to standardize certain aspects of national registers in the USA, Canada and Mexico, in order to make the registers in the three North American countries comparable among them.

The problem is that the Canadian and the system in the USA are really very wide. They are not likely to be a reasonable benchmark for future extensions of both types and number of pollutants and of reporting thresholds for the pollutants in the Aarhus PRTR. This is the reason why the systems in the USA and in Canada are reserved a brief discussion in this report.

The current Toxic Release Inventory (TRI) was implemented in the United States of America in 1987 that was the first reporting year. The USA was the first country in North America to develop a national register.

Nowadays it contains 667 chemicals: 582 individually listed pollutants, 27 chemical categories and 3 delimited categories containing totally 58 chemicals (so, 582 + 27 + 58 = 667) (documents about the TRI).

The TRI monitors releases into air, water and soil.

The way the TRI works is similar to the one of the Aarhus PRTR: when the reporting threshold for each chemical is reached a facility has to report that chemical to the U.S. Environmental Protection Agency.

The Canadian National Pollutant Release Inventory (NPRI)

Although most reporting under the US system are estimates rather than precisely determined quantities, this appears to have little impact on the usefulness of the data because conclusions based on the data are not sensitive to uncertainties in estimates. This is because a limited number of facilities, substances, industries and geographic areas tend to dominate totals when PRTR data are aggregated. Therefore, more precise estimates are unlikely to change the situation substantially. Facilities are expected to do what is practicable. Data can be improved at a later stage by monitoring particular points of uncertainties. Indeed, over time, the accuracy of the data appears to have improved as the reporting industries gain experience.

Canadian facilities have been registering their discharges in the National Pollutants Release Inventory (NPRI) since 1993. This inventory was established in 1992 and legislated under the *Canadian Environmental Protection Act, 1999* (CEPA 1999) (document on NPRI).

It is based on a system that chemical industry association members made mandatory for themselves: this is one the special features of the NPRI (general sheet).

Only facilities that meet established reporting criteria are required to report different types of information to the NPRI. Pollutants from mobile sources are not included in the NPRI but are reported under a separate program (doc on NPRI).

The Canada Gazette of the 17th January 2004 – the most recent change in the NPRI legislation – has pointed out the NPRI substances as a total number of 323 and has divided them in five different categories (“parts”). Another special feature of the NPRI is the co-existence of both general criteria for reporting and specific criteria for each of the five parts of substances listed in the document: these criteria determine both the reporting thresholds for each pollutant and the

activities subject to reporting. Differently from the systems used in the USA and in Mexico, the NPRI uses not only water, air and soil as media for the pollutant releases but also underground injections.

The Australian NPI

Even though Australia is not a member country of the Economic Commission for Europe, its system has got many features (objectives, structure, content and reporting method) in common with the Aarhus PRTR. Australia is an OECD member country: this might explain this similarity. The website on the Australian National Pollution Inventory (NPI) admits the influence of foreign registers: the NPI "is based on similar inventories compiled overseas". It is also amazing to see how well this country has set up a system to collect data for its pollutant register.

Work and consultation on the NPI started substantially in 1995, and in 1996 the National Environment Protection Council (NEPC) decided to implement the NPI by developing an NPI National Environment Protection Measure (NPI NEPM). A project team with members from the Commonwealth, States and Territories was formed, and managed through the NEPC Service Corporation in Adelaide to draft the NEPM and Impact Statement.

To assist in the development of the draft Measure, a Non-Government Organisation Advisory Group was established to ensure industry, environment and community concerns were considered by the Council. Membership included environment, industry and union groups.

An independent Technical Advisory Panel was established to determine a methodology for evaluating substances to be included on the NPI reporting list and, subsequently, to develop the reporting list. The Panel produced a draft report, which was the subject of national consultation in June 1997, along with the draft NEPM and impact statement. Public meetings and workshops were held around Australia over a two-month period.

Based on comments received during this national consultation process, the NEPM was revised. This revision was sent to key stakeholders and further comments sought. The NEPM for the NPI was made on the 27th February 1998 by NEPC. When making the NPI NEPM the NEPC took into account all the submissions received and the Impact Statement.

The NPI NEPM, Impact Statement and Summary Response Document were tabled in the Commonwealth Parliament on the 10th March 1998. They passed through the disallowable period by the 10th May 1998 and came into effect on the 1st July 1998 (doc. on OZ).

The NPI was implemented all over Australia by different Amendments and Acts passed in all States: the register might change name from State to State but the regulation is the same – or more strict – as the national one defined by the NPI.

From the 2001/2002 reporting year, the list of substances to be reported changed into a 90-pollutant list. The latest available data are the 2003-04 NPI facility data – published on the NPI web site on the 31st January 2005 . This was the sixth NPI reporting year, and was the third year facilities were required to report on all the new 90 NPI substances.

The main aim of the NPI is "to help create a cleaner and healthier environment" in Australia: in this case another similarity with the Aarhus PRTR can be found.

There are three main ways of getting the data for the NPI database:

Larger industrial facilities estimate and report their emissions to the government;

State and Territory governments estimate emissions from smaller facilities (e.g. service stations, dry cleaners, fish farming);

State and Territory governments estimate emissions from mobile and non-industrial (also called diffuse) sources, and other sources of pollutants; these sources include:

Household activities:

Lawn mowing (and other small petrol engined tools);

Domestic wood combustion;

Consumer use of solvents, such as hair spray and car tyre blacker;

Cigarette smoking;

Architectural surface coating;

And transport-related activities:

- **Motor vehicles;**

Aircraft;

Ships;

Pleasure craft.

If, in a reporting period, there is an industry handbook for a specific facility and this facility fulfills one of the five categories of reporting thresholds (the NPI uses five categories of thresholds (1, 1a, 2a, 2b and 3)) (see doc. on OZ (the guide)), then it is required to estimate and report emissions of those substances to the relevant State or Territory environment agency for that reporting period. Only substances for which an NPI reporting threshold is exceeded are reported to the NPI.

Many smaller facilities use less than the threshold amounts of the substances listed on the NPI. This means they are not required to report their emissions to the NPI themselves. However, emissions from smaller facilities may be significant for a particular region. Therefore, State and Territory environment authorities estimate the emissions from many smaller facilities to ensure that the NPI database is as comprehensive as possible.

If a facility is required to report, emissions of NPI substances to air, land and water need to be estimated. For this purpose, Emission Estimation Technique (EET) manuals have been created by the government to find out how to estimate NPI pollutant emissions. There are nine NPI manuals used by many different sectors:

Combustion in Boilers;

Combustion Engines;

- **Explosives Detonation;**

Fuel and Organic Liquid Storage;

Fugitive Emissions;

Maritime Operations;

Railway Yard Operations;

Sewage and Wastewater Treatment;

Surface Coating (e.g. painting).

Emission Estimation Technique manuals are listed both alphabetically and by industry sector. Some industry sectors may require one or more EET manuals. Facility operators may use other techniques not specified in the EET Manuals, but only with approval from the relevant State or Territory environment agency.

Also manuals for diffuse sources have been created to standardize methods to estimate them.

The State and Territory environment authorities collect and assess the emissions data provided by larger industrial facilities, and estimate emissions from other sources (smaller companies, mobile and non-industrial). They forward the information to the Department of the Environment and Heritage which then compiles the information and loads it on to the Internet (doc. on OZ).

In the new 90-pollutant list many of the Aarhus pollutants are included and many others not included in the Aarhus list are covered by the NPI.

As we said the NPI has got five categories of thresholds and – inevitably – it sometimes has general limits that do not suit the specific pollutant very well: this is especially evident among the metals, where the same threshold is used for every substance.

The Mexican RETC

The only register we are going to discuss more deeply among the North American systems is the Mexican *Registro de Emisiones y Transferencia de Contaminantes* (RETC). The register is quite different from the two other systems in North America: in fact, comparable data with them are not available for Mexico yet. The RETC was put in place in 1997 – and that was also the first reporting year– after a national consultation and a case study in the state of Querétaro, in which industry associations, academics, civic groups and officials participated.

The system used to be voluntary for the first seven reporting years, but it has been mandatory since 2004. Each company is requested to report to the RETC if it fulfils the reporting requirements (being above the reporting thresholds).

The RETC includes a list of 104 pollutants and when a polluter is above a specified threshold it has to check its releases in all the media monitored by the register, that is to say, air, water and soil. The Mexican register groups the pollutants into different categories. Therefore, it has sometimes too general limits that do not suit the specific pollutant very well: this is especially evident among the metals, where the same threshold is used for every substance.

The new Chilean PRTR

Both Canada and the USA committed to develop a PRTR system in Chile as a consequence of the free trade agreements they signed (separately) with Chile. Chile was helped by Canada in the first part of the national study and, in the second part, by the U.S. EPA (Environmental Protection Agency). Five Chilean delegates were sent to the States to check how the US TRI works:

Two national coordinators of the Chilean PRTR;

One member of the legal group;

One member of the technological group (Database expert);

One representative of NGOs;

One delegate of the facilities was invited but he did not go to the US.

UNITAR was called as an expert agency to lead Chile towards the implementation of a national PRTR. The objectives of the project were to assess the feasibility for a PRTR system in Chile. UNITAR usually uses a six-step approach to assess the feasibility for a PRTR system in a country - it was used in the co-operation with Chile as well. As for Chile, the feasibility was assessed in 2003.

Now Chile is in the process of finishing the design of its pollutant register: it is going to be ready by July 2005.

After this, Chile has to implement the PRTR: this requires the (financial) support of various funders.

As the national Chilean PRTR is not officially designed, only unofficial information exists about it.

There are going to be two kinds of reporting in the register: one is going to be mandatory and the other one is going to be voluntary.

Chile is also going to monitor both point and diffuse sources.

Status of relevant Multilateral Environmental Agreements

Parties to the Aarhus Convention Protocol (ACP) are already legally bound by various environmental conventions and international and regional agreements that cover a subset of the substances and/or activities of the ACP. These are concerned with protecting the atmosphere, with chemicals and hazardous wastes and with regional seas. These commitments imply that Parties are already measuring, estimating or calculating emissions to air, land, water or soil and, in some cases, transfers of these substances. Therefore, an operating ACP would not impose significant incremental costs for those substances already covered by other multilateral environmental agreements (MEAs). This section reviews relevant MEAs that overlap with the ACP and discusses the degree and depth of overlap. Consequences on the methodology we adopt will be discussed in a later section.

Montreal Protocol on Substances that Deplete the Ozone Layer under the Vienna Convention on the Protection of the Ozone Layer

Trade-related instrument – much in common with Stockholm and Basel.

The Montreal Protocol (MP) entered into force on 1 January 1989. All but two UN/ECE member states have ratified, approved, accepted or acceded to the MP.[17] Under the Protocol, Signatories have committed to limiting emissions of three substances in the ACP.[18]

Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol (KP) entered into force on 16 February 2005 and is legally binding on most UN/ECE member states.[19] Signatories are committed to ensuring that their aggregate anthropogenic carbon dioxide equivalent emissions of greenhouse gases do not exceed their assigned amounts. The emissions to be limited concern six substances on the ACP list.[20]

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

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[17] All except Andorra and San Marino.

[18] These are substances 14-16 in the ACP list, namely, hydorchlorofluorocarbons (HCFCs), chlorofluorocarbons (CFCs) and halons.

[19] All UN/ECE Member States except Albania, Andorra, Belarus, Bosnia and Herzegovina, Croatia, Kazakhstan, Monaco, San Marino, Tajikistan, Turkey and the United States of America.

[20] These are substances 1, 3-5, 9-10 on the ACP list, namely, methane, carbon dioxide, hydro-fluorocarbons, nitrous oxide, perfluorocarbons and sulphur hexafluoride.

This Convention aims to control trade in selected dangerous chemicals through informed consent and is a self-contained convention that works through Annex/Annex (rather than a Protocol), revised periodically through decisions of the conferences of the signatories.

Stockholm Convention on Persistent Organic Pollutants

This Convention aims to phase out, restrict and reduce the production and use of certain chemicals and is a self-contained convention that works through Annex/Annex (rather than a Protocol), revised periodically through decisions of the conferences of the signatories.

Trade-related instrument – much in common with Montreal and Basel.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

This Convention aims to reduce production of hazardous wastes and their transboundary movements. Of the MEAs covered here, this is the only framework convention, implying that protocols can be developed for addressing specific subjects requiring more detailed and specialised negotiations.

Trade-related instrument – much in common with Stockholm and Montreal.

Convention for the Protection of the Marine Environment for the North-East Atlantic, Action Plan 1998-2003, Update 2000, Annex 2: Chemicals for Priority Action (OSPAR)

This Convention is self-contained in that it works through Annex/Annex (rather than a Protocol), revised periodically through decisions of the conferences of the signatories.

UN/ECE Protocol on Heavy Metals

UN/ECE Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (Protocol to UN/ECE Convention on Long-range Transboundary Air Pollution)

UN/ECE Protocol on Persistent Organic Pollutants

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National PRTRs