United Nations Institute for Training and Research

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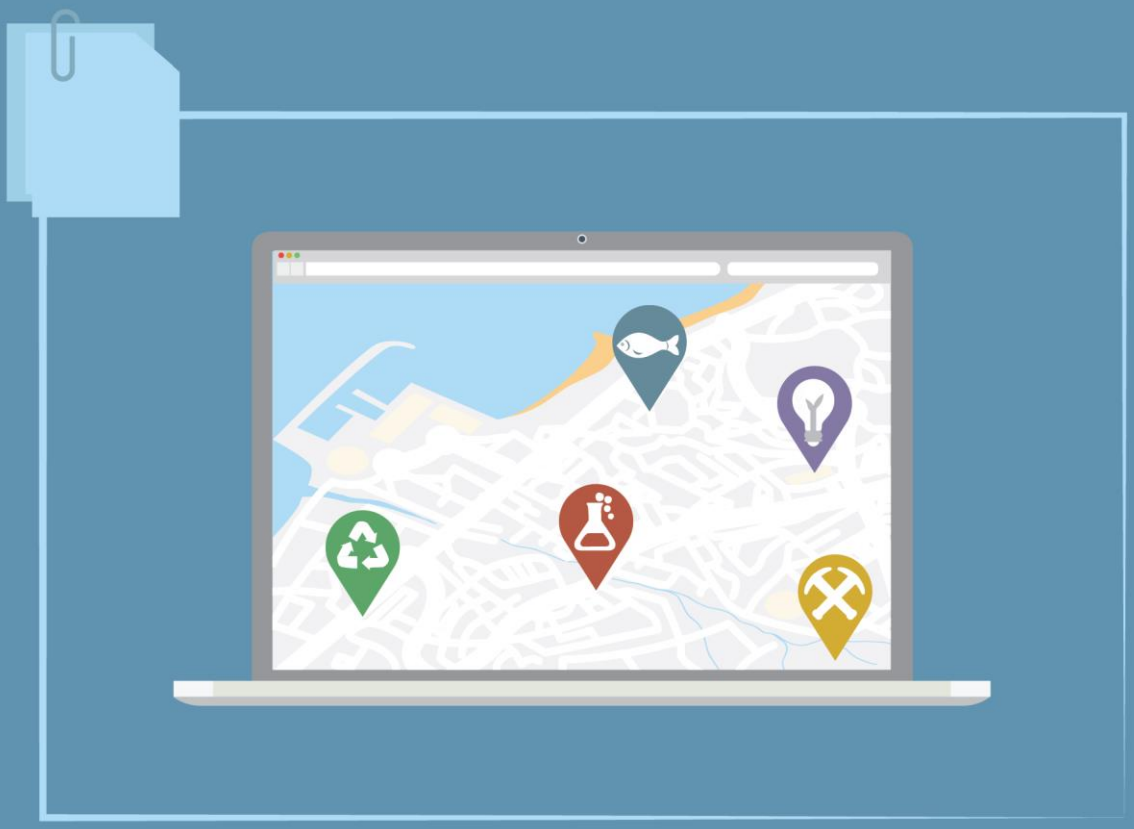
Online Reporting for Pollutant Release and Transfer Registers



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I. Background

The purpose of the factsheet is to expand on the information in the video module on On-Line Reporting systems for Pollutant Release and Transfer Register (PRTR) Data (available at prtr.unitar.org/site/prtr-learn).

In this paper:

- ✓ The value of an on-line PRTR reporting system
- ✓ Important functions to consider during design
- ✓ What to include in a design document
- ✓ Trade-offs between building a new system vs. modifying an existing reporting system

For Pollutant Release and Transfer Register (or PRTR) programmes, on-line reporting systems are an essential part of collecting release and transfer data that are recent, accurate, and comprehensive. The collection of data from facilities is foundational to the mission of PRTR programmes who utilize the reported PRTR data for decision-making and programmatic activities, and also publish PRTR data for other stakeholders to analyse. Without an on-line reporting system, PRTR data are typically submitted piecemeal in email attachments or by paper forms, which increases the likelihood of errors, increases costs and expands the time needed for PRTR publication.

For facilities subject to PRTR requirements, a PRTR's on-line reporting system is the primary way they interact with the PRTR programme. To maximize the quality of the data submitted, the user experience must be clear and be designed to minimize facilities' effort needed to submit their data.

For governments developing a PRTR reporting system, the on-line system should be designed to capture high-quality data and at the same time, minimize the costs of both building and operating the system.

While the content of PRTR reporting may be straightforward, there are numerous considerations that a programme must address when designing and developing the system so that it takes advantage of ever evolving information technologies, builds on existing reporting systems and web services wherever possible, and minimizes costs for facilities and the PRTR programme.

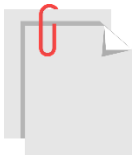
The benefits of an on-line reporting system are operational efficiency of PRTR reporting and data management as well as ensuring that PRTR data are of acceptable quality and can be made available soon after they are received. Specifically:

- Implementing self-administered user registration and robust user authentication result in secure exchange of what may be sensitive data;
- Embedding quality controls into the reporting system - e.g., requiring entry of data in a particular format or setting bounds for acceptable values – can eliminate outlier values and thus speed up publication of PRTR data;
- Implementing push notification capabilities in the system can improve compliance with PRTR reporting;
- Standardizing facility identification and other PRTR information and identifiers allows integration of PRTR records with data from other reporting programs; and
- Linking guidance documents on, for example, release estimation techniques, where appropriate in the reporting systems delivers just-in-time support to facilities.

The content of this document is based on OECD's existing guidance related to on-line reporting systems, a review of system designs, and the experience of PRTR programmes related to their on-line reporting systems. Related documents and web resources are cited in the Resources section of this factsheet.

II. Planning

a. Preparing a Design Document



An early step in the design process is to prepare a design document that lays out the purpose and scope of the electronic reporting system. A one- to two-page design document establishes the purpose of the reporting system, high-level requirements for how users will interact with the system, and how the data collected will be stored and made accessible to the PRTR programme for its use and publication. Given this is a written document, it can be easily shared with PRTR stakeholders, governmental ministries, those involved in preparing detailed requirements for the reporting system, and those developing the reporting system. The Design Considerations section provides additional details and options, some of which should be reflected in the high-level design document.

b. Potential Use of Existing Reporting Systems

Building on an existing reporting system developed by the government for other environmental programmes may not always be possible, but this strategy should be investigated as it can reduce costs of developing an on-line PRTR reporting system. This approach can also simplify facilities' experience reporting across environmental programmes. In general, there are two parts of existing reporting systems that might be useful for a PRTR system:

the reporting software/data collection systems and

data storage.

It may be possible to modify existing facility-based reporting systems that are used for permitting or emissions reporting. For either a stand-alone system, or when adding to an existing system, it is also possible to utilize open source software developed by other PRTRs (OECD, 1996). Currently, several governments and organisations provide open source software and information exchange schemes that can be adapted for use by other PRTR systems, including the E.U.'s E-PRTR, the German PRTR, and PRTR España (OECD, UNECE, and UNEP, 2014b). Germany has provided it's PRTR reporting software to other governments to modify and use.

To assess the suitability of an existing reporting system for expansion to add PRTR reporting, programmes conduct a Gap Analysis.

A Gap Analysis compares PRTR requirements to the function and features of an existing system. It identifies which elements of the existing system are suitable for PRTR reporting, what modifications would be needed, and what new features would need to be developed to support PRTR reporting.

c. On-line Reporting Software vs Data Exchange

Some PRTR programmes – such as, Canada's NPRI – utilize web-based reporting software where facilities enter their PRTR data into the web-based reporting application. Other PRTR programmes – such as the EU – define acceptable file formats and allow facilities to upload a file that contains all required PRTR data for a given year. The US TRI program both supports on-line reporting and allows for file uploads. New PRTR programmes will also choose whether to develop an on-line reporting system or to establish data exchanges procedures. Web-based software applications offer several advantages: facility staff with Internet access can easily create an account and submit their PRTR data; validation checks, embedded calculators, and guidance can be built into the software; and software updates are available to all users. Alternatively, PRTRs can define file structures that facilities can use to submit PRTR data via a file exchange or even email attachments. With this approach, more data processing effort may be required on the part of the PRTR programme and validation checks occur only after the data are submitted.

III. Design Considerations

Whether the PRTR reporting system is a modification of an existing reporting system or a stand-alone system, whether the PRTR reporting system will be built internally by staff or developed under contract, a detailed, written plan will be important in defining and prioritizing each and every feature and requirement. Written requirements documents can be easily shared and even used as the basis of agreements or contracts for developing the system. The more specific these documents are, the better. With a detailed plan, software developers can prepare accurate estimates of the cost of building and maintaining the reporting system; testing protocols will be focused on important features and functions; and the time needed for development, testing, and deployment will be shortened. This section addresses the type of information that needs to be included in the design document.

The design document outlines data management procedures for systematic processing of PRTR data in each step of the PRTR reporting cycle (UNITAR and IOMC, 1997). These steps include receiving reported data; compiling data; quality assurance procedures and controls; and data storage. Data publication and processing for analysis are not considered part of the reporting system.

Consistent and logical conceptual data models, data processing, and data exchange is a harmonisation goal and will facilitate integration with other PRTRs (OECD, 1996 and UNECE, 2014a).

a. Database Design

PRTR programmes must address a number of design issues when developing an on-line reporting system and a database, which are needed to collect, compile and store PRTR data. Key considerations for the design and development of the database that will store PRTR data include:

- Identify and define all data elements that will be stored in the database;
    - Each data element reported by point-source facilities;
    - Data on diffuse sources, if covered by the PRTR;
    - Derived data fields (e.g. total releases = sum of air, water, and land releases); and
    - Metadata (e.g. date submitted, reporting format, date revised etc.);

- Use of permanent record identifiers for facilities will allow linking of submissions across years and facilitate trend analyses;
- The size of the database needed to house the data;
- The structure of the database that optimizes data for storage, editing and retrieval;
- Procedures for database management (e.g. version control, back-up, error notification and correction, etc.);
- Data quality controls that are implemented at various stages, including initial data collection, compilation, processing, storage, and revision;
- The frequency of data refreshes, updates and additions;
- Procedures for exporting data from the database (e.g. exporting raw data; exporting data for routine analysis (e.g. data structured for analysis in periodic data quality reviews); data feeds for updating data dissemination tools);
- Security procedures to identify and protect data claimed as confidential by reporters (Section 2.4.2 of Guidance on Elements of a PRTR: Part I);
- Where the database will be hosted;
- Hardware, software, and equipment requirements; and
- Available resources for database development and maintenance (OECD, 2015; OECD, 1996; UNITAR and IOMC, 1997)

When developing an online PRTR reporting system, it may be useful to review general software and hardware considerations related to a PRTR data collection system. The most important consideration that may not be apparent early in the design process is that if a commercial software would need to be modified to meet PRTR requirements, the cost to do so may exceed that of custom development. Note that mention of commercial product names does not imply endorsement. General advice includes:

- In general, there are two models for data submission:

Data File Transfer - The PRTR defines a data schema for acceptable submissions. Facilities use commercial or their own custom-developed software to compile their submission files. The PRTR maintains a website to receive and process data file submissions. The European Union utilizes this model.

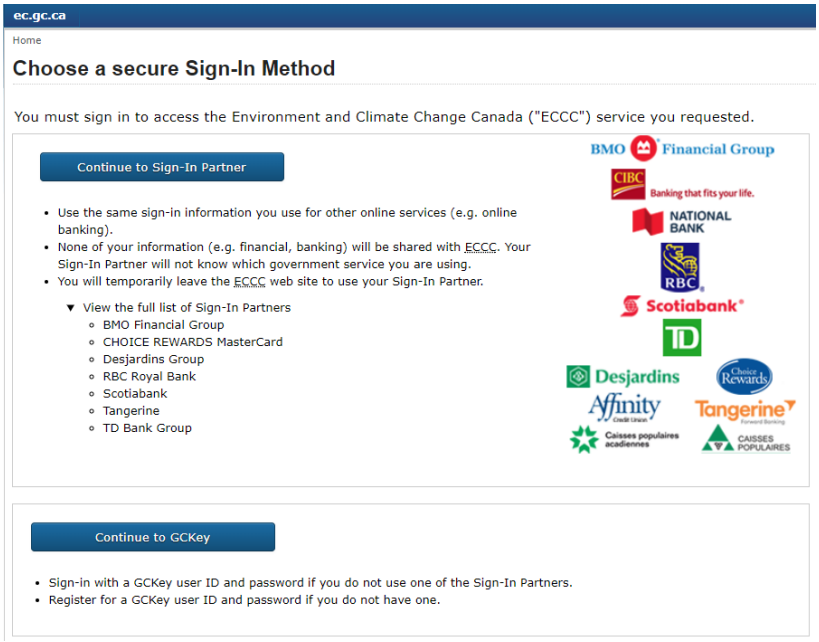
Web Application - The PRTR develops and maintains a web application in which facilities enter and/or update each data field. This approach allows for embedded data quality checks and more user assistance. Canada and the United States use this model.

The data file transfer model can be expected to have lower life-time costs. The web application model can embed reporting guidance, data quality checks, and other user-centered features.

- Preference should be given to well-supported open source software solutions that can be maintained and modified by PRTR staff. For example, both WordPress and Drupal offer both login features as well as supporting databases.
- Cloud hosting (e.g., Amazon Web Services, Microsoft Azure) of reporting system and databases can reduce hardware and IT infrastructure costs while providing sufficient security and reliability, especially if the PRTR authority does not have a mature enterprise architecture.

b. User Authentication/Role-based Access

Data integrity and security of potentially confidential data are the primary reasons for controlling who is allowed to create, edit and/or view PRTR records and ensuring that only appropriate users are allowed access to the PRTR records they create. These two functions - user authentication joined with role-based access -- are now functions offered by several commercial software platforms and need not involve the expense and complexity of a custom-built solution. For instance, Canada utilizes both a commercial and government-wide user authentication for its PRTR log-in (see figure).



If the system affiliates users with their organizations, this allows for a more efficient and effective reporting process. For example, the same individual could enter data for several facilities operated by the same company or a company official could easily review and certify submissions for all of a company's facilities. In addition, several programmes require that a facility official certify via a validated electronic signature that their submission is accurate, complete and truthful. Certification of PRTR reporting can be done with web services, or simply by linking a one-time ink signature followed by on-line user authentication by a registered user.

c. Quality Controls

Additional features of an on-line reporting system can improve data quality. In general, PRTR programmes have found that providing data quality checks, calculators, and reporting guidance within the on-line reporting system have improved the quality of the data submitted.

- Embedding data quality checks in reporting software. When data quality checks are included in reporting software, data can be reviewed before they

are reported to the PRTR. These checks can include validation steps for data fields (e.g. checking that no text is entered into a numeric field), internal consistency checks (e.g. checking that a facility's address is consistent with its state/province/region), checks for missing values (i.e., checking that all required field are complete) and checks against data reported in prior years or by similar facilities (e.g. checking for large increases or decreases in reported releases or transfers compared to the prior year). (OECD, 2008)

- Developing stand-alone data validation software. If not integrated into the on-line reporting system, data validation software may nonetheless be used to automate review of reported data and to produce output reports listing potential data quality issues. Software can range from basic (e.g. checking for large year-to-year changes in reported values, changes in the chemicals reported) to more sophisticated (e.g. reviewing patterns in reporting by sector and chemical and identifying potential data quality issues where submissions deviate from the patterns reported by peer facilities). Unlike quality controls integrated into the reporting system, stand-alone data validation does not allow notification of users of potential errors before they submit their PRTR data. (OECD, 2008)

d. Prepopulating

Protocols for prepopulating data fields and providing sufficient prompts and caveats avoid misunderstandings on the part of PRTR facilities. Prepopulated data typically is extracted from the prior year's reporting or a separate, trusted data system. For example, the US Toxics Release Inventory (TRI) reporting system pre-loads facility identifying information for facilities that have reported in prior years. This information is available when facility staff initiate reporting using their unique facility identifier. Pollutant-specific information, such as previously reported off-site locations for transfers, is also prepopulated for each chemical.

e. Push Notifications and Outreach

Because an on-line reporting system requires registration of individuals and organizations affiliated with facilities who have PRTR reporting obligations, it creates an opportunity for the PRTR programme to expand communications with this community. The programme can initiate messaging either via the reporting system or via email related to PRTR reporting deadlines and refer PRTR reporters to resources and guidance for them to use in preparing their PRTR submission, such as common errors and data quality analyses from the prior year.

f. Guidance for Using the On-line System

Timely and tested guidance on how to use the reporting system is critical for both first time users and returning users. Such assistance can reduce the level of effort for facility staff involved in reporting and improve the quality of information submitted to the PRTR. In general, such guidance can be organized by the chronological steps that a facility would encounter:

- getting started with background on the reporting system
- registration
- login
- completion of required data elements
- common problems and their solutions
- review and certification
- submission
- what to expect following submission
- revisions

On-line reporting system guidance may be embedded in the software or in the form of videos, tutorials, or documents. See the links below for several examples from established PRTRs.

- Germany provides comprehensive background information about its on-line reporting https://www.thru.de/3/information/questionanswer/
- Canada's programme provides web-based tutorials that illustrate navigation and required reporting https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/instructional-videos.html
- The United States provides tutorials describing specific features and functionality of the online reporting system available through the programme's website and also linked directly within the on-line reporting system https://www.epa.gov/sites/production/files/2017-04/documents/tri_mini_tutorial_list.pdf

IV. Conclusion

Throughout this factsheet we have examined how design decisions, selected elements, and functions of an on-line system for reporting PRTR data can make the collection of PRTR data efficient, cost-effective, and generate accurate and timely data for the PRTR programme and other stakeholders.

Consideration of existing data reporting systems and web services along with careful planning and design are crucial for the development and operation of an efficient on-line reporting system for PRTR data.

To the extent that planning for the on-line system takes into consideration other reporting requirements faced by PRTR-reporting facilities and potential future changes to the PRTR programme, the on-line system can serve as a catalyst for environmental management efforts within the country.

V. Resources

OECD (2014), *Guidance Document on Elements of a PRTR: Part I (2014)* Series on Pollutant Release and Transfer Registers No. 17, Organisation for Economic Co-operation and Development, ENV/JM/MONO(2014)33, Paris, November 2014

OECD (2015), *Guidance Document on Elements of a PRTR: Part II (2015)* Series on Pollutant Release and Transfer Registers No. 18, Organisation for Economic Co-operation and Development, ENV/JM/MONO(2015)45, Paris, November 2015

OECD (2008), *Considerations for Ensuring Quality PRTR Data (2008)* Series on Pollutant Release and Transfer Registers No. 11, Organisation for Economic Co-operation and Development, ENV/JM/MONO(2008)11, Paris, July 2008

OECD (1996), *Pollutant Release and Transfer Registers (PRTRs): A Tool for Environmental Policy and Sustainable Development - Guidance Manual for Governments*, OECD/GD(96)32, Paris 1996.

UNITAR and IOMC (1997), *Designing the Key Features of a National PRTR System,* UNITAR Guidance Series for Implementing a National PRTR Design Project, UNITAR and Inter-Organization Programme for the Sound Management of Chemicals (IOMC), 1997

UNECE (2014a), *PRTR Cost Model*, United Nations Economic Commission for Europe (UNECE), Geneva, 2014a

UNECE (2014b), *Introducing UN/EDIFACT (Electronic Data Interchange for Administration, Commerce and Transport)*, United Nations Economic Commission for Europe (UNECE), Geneva, 2014b