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Agenda item 4 (b): Review of technical annexes to the NAP update *Guidelines*
(UNEP(DEPI)/MED WG. 393/10)

Updated guidelines to assess national budget of pollutants (NBB)

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1. Introduction

In the framework of the operational strategy for the implementation of the Strategic Action Programme (SAP-MED), adopted by the 12th Meeting of the Contracting Parties to the Barcelona Convention (Monaco, November 2001), the Mediterranean countries should prepare a National Budget (NBB) of emissions/releases for the SAP-MED targeted pollutants covering all the substantial Land Based Sources. The assessment of pollutants' loads constitute an important tool for both identifying and prioritizing issues to be addressed in the NAPs and evaluating the level of achievement of SAP MED targets through the implementation of the NAPs. In this context, the Countries prepared their first NBB in 2003 followed by the second in 2008 based on 2003 agreed NBB guidelines.

In view of NAP update as mandated by COP 18, Istanbul Turkey, 2013, the Secretariat developed the Guidelines for updating NAPs that comprised a number of technical annexes including one annex containing the updated NBB guidelines.

At their meeting held on 26-28 March 2014 (Athens), the MED POL Focal Points approved the main body of the "Guidelines for Updating National Action Plans (NAPs)" (UNEP(DEPI)MED WG.394/10) and generally reviewed the proposed technical annexes. The Secretariat was asked to particularly continue the work for prioritization of sector/contaminants and finalization of NBB update (Annex B of the NAP update guidelines).

The present document represents a revised draft NBB guideline. It takes into account comments made during the meeting of MED POL FP in March 2014 including proposals to ensure the NBB harmonisation with PRTR. The document contains four major principal sections addressing:

- a) NBB object and scope
- b) NBB calculation
- c) NBB InfoSystem
- d) NBB and PRTR harmonization

A list of emission factors is presented in the Annex to this document.

2. Object and scope of the NBB updated guidelines

These guidelines have been prepared in order to assist the countries in the estimation of Baseline Budget (NBB) for the SAP MED targeted pollutants. They are designed to be applicable to all countries.

They include the methodological principles for the gathering of data and information concerning the loads of pollutants discharged in the Mediterranean by land based sources. It also includes a detailed description of the steps that should be followed for the calculation of the total loads discharged by the various land based sources of pollution, either from PRTR data or discharge permits or on the basis of Emission Factors.

The scope of the loads of pollutants is:

- Liquid loads discharge by industrial activities, municipal wastewater, effluents from wastewater treatment plants, leachates from landfills, pollution loads from coastal streams and runoff.
- Atmospheric emissions – point source emissions and major area sources.

As for sector categories and pollutants, SAP MED covers the following categories of substances based on Annex I.C of the LBS Protocol and selected as priorities. They both cover urban environment and industrial development, radioactive substances and hazardous waste have been removed for not being within NBB scope:

Table 1. SAP MED sectors, categories and substances.

Sector	Category	Substances
Urban environment	Municipal wastewater Municipal solid waste Air pollutants	
Industrial development	Toxic, Persistent and Liable to Bioaccumulate (TPB)	Aldrine DDT Dieldrine Endrine Chlordane Heptachlor Mirex Toxaphene Hexachlorobenzene PCB/PCT PCDD/PCDF PAH Mercury Cadmium Lead Organometallic compounds
	Other heavy metals	Zinc Copper Chrome
	Organohalogen compounds	Chlorinated solvents Chlorinated paraffins Chlorobenzenes Polychlorinated naphthalenes (PCNs) Polybrominated diphenyl ethers and polybrominated biphenyls Chlorophenols Lindane Chlorophenoxy acids
	Nutrients and suspended solids	BOD ₅ Nutrients

Sector	Category	Substances
		Suspended solids

As a minimum, NBB should cover all the pollutants evaluated as priority substances agreed by MEDPOL Focal points at their meeting held in Aix en Provence, France in November 2009 and listed in Annex II of Decision IG.21/3. Currently, this list is in the update process.

Sector categories (30) are established in Annex I.A of the LBS Protocol. Thus a number of subsectors (up to 97) are defined for each sector.

3. NBB calculation

The approach to 2013 NBB includes the following primary stages:

1. Determine the areas from which liquid and air emissions may reach the Mediterranean.
2. Map all emission sources in the area of interest.
3. Gather emission data for all emissions sources.
4. Assess the portion of total emissions that eventually reach the Mediterranean.
5. Consolidate data and avoid redundancy where duplicates occur.

3.1. Determining the administrative region/s

The first step for estimating the NBB is to identify the administrative region/s in which the land-based sources of pollution affecting the Mediterranean Sea are located, that is, the identification of the administrative region/s that best fits the basin area. This should be done for liquid and air emissions separately.

(a) Basin Area for liquid emissions

In this area, liquid emissions discharged by various sources have the potential to eventually be deposited in the Mediterranean, either by direct disposal of wastewater into the sea, or indirectly by runoff and wastewater disposal in streams reaching the Mediterranean.

The main contributors of liquid emissions are industrial activities, urban sewage and wastewater, runoff, and agricultural activities.

The determination of the basin area will be made with respect to the following routes of marine of emission:

- Direct marine discharge by point sources.
- Discharge to coastal streams by point sources.
- Runoff (into coastal streams).
- Direct Runoff (to seawater).

The determination of the area of influence has to be made individually for every territory or region. Generally, the boundaries set by the drainage basin can be used to determine the area of influence. In case this basin is too vast, it can be divided into sub basins according to the geographical

characteristics while considering the potential reduction in pollutant loads along the route (e.g. according to degradation, adsorption etc.).

As an alternative to assessing the total runoff pollutant loads, it can also be assumed that all runoff drain goes to stream channels. Based on this assumption, pollutant loads can be assessed by sampling the pollutant loads downstream prior to the intersection with the sea.

(b) Air Basin for Atmospheric Emissions

The determination of the area from which atmospheric emissions have the potential to be carried and deposited into the Mediterranean is based on climatic and geographical analysis for each basin. The air basin will be determined for every territory or region with respect to the following:

- Proximity to the Mediterranean coast.
- Characteristic wind regime (significant portion of time in which the wind blows with a seaward component).

3.2. Mapping the emission sources within the basin

Accurate information on liquid and atmospheric sources of pollution and related activities should be mapped within their suitable basin. The general categories of emission sources are:

- Industrial activities,
- Transportation sources,
- Stream heads,
- Waste water treatment plants,
- Landfill runoffs,
- Any other category.

Once sources of pollution are determined, they should be classified according to the corresponding sector (Annex I.A of the LBS Protocol) and subsector.

3.3. Preparing the NBB database

After identifying all emission sources in the basin, a database containing emission data from all sources has to be established. Accurate, local data should be preferred wherever possible. After the available information was examined and verified, information gaps should be identified and completed if possible.

The following are the principle data sets required for a complete estimation of all pollutant loads reaching the Mediterranean Sea:

- Information concerning all industrial activities in the relevant area – liquid and atmospheric emission loads.
- Information concerning atmospheric emissions from vehicles.
- Information concerning all streams that flow into the Mediterranean – specific pollutant loads/concentration, flow volume.

- Information concerning unregulated landfills - leachate loads, runoff, and pollutant permeation to groundwater bodies that are linked to the Mediterranean water.
- Information concerning domestic wastewater discharge – direct marine discharge, collection and treatment, and effluent quality in the WWTP outlet when disposed to streams/sea.

Recommended data sources for each category are described in the next sections:

3.3.1. Industrial activities

The recommended data sources are prioritized according to the following order of precedence:

(a) Using PRTR data

PRTR reported data constitutes a good database for liquid and atmospheric emissions which is based upon actual installation-level data on production, energy and resource consumption, emission reduction, etc. This data usually undergoes quality control and is generally the best source of overall emission estimation.

Concerning E-PRTR initiative in particular, Mediterranean countries are required to address some gaps in order to convert E-PRTR into NBB data. The following table shows main differences between NBB and E-PRTR approaches:

Table 2. Comparison between NBB and E-PRTR.

<i>Issue</i>	<i>NBB</i>	<i>E-PRTR</i>
Geographical scope	Administrative regions located in drainage basins that outflow into the Mediterranean.	All regions and river basin districts
Source type	Point sources (industry and urban centers).	Industrial facilities and diffuse sources ¹ .
Scope of point sources	All point sources irrespective of their capacity.	Only if the facility exceeds the following thresholds: a) falls under at least one of the 65 E-PRTR economic activities listed in Annex I of the E-PRTR Regulation and exceeds at least one of the E-PRTR capacity thresholds b) transfers waste off-site which exceed specific thresholds set out in Article 5 of the Regulation c) releases pollutants which exceed specific thresholds specified for each media - air, water and land - in Annex II of the E-PRTR Regulation
Media	Water and air	Amounts of pollutant releases to air, water and land as well as off-site transfers of waste and of pollutants in waste water

¹ The E-PRTR Regulation (Article 8) requires the Commission, assisted by the European Environment Agency, to include in the E-PRTR information on releases from diffuse sources, where such information exists and has already been reported by Member States.

<i>Issue</i>	<i>NBB</i>	<i>E-PRTR</i>
Emission scope	Direct emissions to drainage basins or into the sea.	Direct emissions and indirect emissions (going to an external treatment plant).
Sector categories	1) Sectors according to LBS Protocol 30 categories 2) Subsectors: 97 categories	1) Annex I of the E-PRTR Regulation: 9 sector categories 2) NACE Main Economic Activity 65 categories
Groups of pollutants	<ul style="list-style-type: none"> • Hydrocarbons • Metals and compounds • Nutrients, SS and BOD/TOC • Organohalogen • Other atmospheric pollutants • Other inorganic compounds • Other organic compounds 	<ul style="list-style-type: none"> • Greenhouse gases • Other gases • Heavy metals • Pesticides • Chlorinated organic substances • Other organic substances • Inorganic substances
Method of quantification	a) Measurement of the concentration levels of emissions at the source and quantification using additional data on the source activity. b) Estimation of emissions based on emission factors and industrial activity rates, material flow, etc.	a) Measured (M): Release data are based on measurements. Additional calculations are needed to convert the results of measurements into annual release data. b) Calculated (C): Release data are based on calculations using activity data (fuel used, production rate, etc.) and emission factors or mass balances. c) Estimated (E): Release data are based on non-standardized estimations.

To address such gaps and in view of NBB and E-PRTR harmonization, some conceptual and technical adjustments are proposed within these guidelines, which are described in section 5.

(b) Direct measurements

Where a PRTR program is not implemented or available PRTR data need to be complemented with additional sources/installations, the elementary database should be composed using the next best information source available, which is installation-specific data on direct measurements.

This calculation usually provides the most reliable and exact results, assuming that the equipment complies with common standards, is fit for use, calibrated for the correct emission rate, is suitable for the emission that is measured and if the sampling is performed at the proper frequency.

Direct measurement includes:

- Calculation of emissions into the air from sampling results:
 - *By creating an emission factor,*
 - *By activity hours.*
- Calculation of emissions into the air from continuous monitoring data.
- Calculation of releases and transfers to effluents from sampling data.

(c) Indirect monitoring

Indirect monitoring is based on a connection between the characteristics of the industrial process and the emissions.

This method may be applied in a process in which the emissions depend directly on the conditions of the process for which the measurement is performed. Releases and transfers to effluents from industrial processes are usually a function of process characteristics, such as temperature, pressure or acidity; and therefore constitute a candidate for calculating the quantity using indirect monitoring data. In any case in which indirect monitoring is used to verify the connection between the monitored parameter and the emission.

(d) Discharge permits

If no reporting data from the industrial installation is available, the assessment of pollutant loads can be made according to the discharge loads approved in the permit.

(e) Emission factors

Industrial activities for which previous emission data/information are not available, pollutant loads can be evaluated using emission factors. Emission factors are numbers that may be multiplied by a rate of activity or rate of production of any installation (such as energy generation, water consumption, fuel consumption).

The UNEP/MAP report on industrial emission factors (UNEP/MAP, 2014b) includes a set of emission factors for liquid and atmospheric emission from the majority of industrial activities.

3.3.2. Atmospheric emissions from transport

Assessing the emission loads from transportation activities is typically complex and requires the use of modeling. Because of the inherent complexity of the models, previous analysis of the transportation sector is preferable. If no such analysis is available, calculation could be done using the overall fuel consumption and available emission factors as described in UNEP/MAP report on industrial emission factors (UNEP/MAP, 2014b).

3.3.3. Information concerning streams flowing into the Mediterranean

The coastal streams that flow into the Mediterranean act as an output for both area source emissions such as agricultural and urban runoff, and point source emissions such as industrial activities with direct discharge to the streams. The assessment of pollutant loads from these sources can be done by sampling as far downstream as possible, and multiplying the average pollutant concentration by the average flow volume. In order to avoid redundancy, data from stream sampling and point source emissions should be prioritized (see section 3.5 for database consolidation).

3.3.4. Information concerning unregulated landfills

Unregulated landfills are a source of leachate, polluted runoff, and possible groundwater pollution that can potentially reach the Mediterranean. Additionally, landfills in close proximity to the coast

can be a source of solid waste washing to the sea. Site specific evaluation of the landfill infrastructure should be done in order to assess the pollution loads.

3.3.5. Information concerning domestic wastewater discharge

Information should be gathered concerning the amounts of domestic wastewater directly discharged to the Mediterranean and to the coastal streams. Pollutant concentration and flow volumes should be monitored and assessed for the determination of the final loads of pollutants discharged to the Mediterranean.

3.4. Estimating air pollutants that are deposited into the Mediterranean

The assessment of the liquid loads deposited into the Mediterranean from most land based sources is usually derived directly from the discharged loads.

Nevertheless, air pollutants released to the atmosphere by various sources will only be partly deposited into the Mediterranean. Air pollution facilitates a major source of seawater pollution (heavy metals, acids, etc.) and should be carefully assessed due to its inherently complex variety of mechanisms for marine deposition. The effect of air pollution on seawater quality arises from dry and wet deposition processes occurring naturally in the atmosphere. The mechanisms of deposition vary for different kinds of particles and gases. In order to take into account all the different types of pollutants and mechanisms of deposition, very complex models should be used. Since this information is complicated to acquire and some of it is still being researched, a simplified assessment should be carried out.

The basic assumption for the evaluation is that all substances carried towards the sea by wind will eventually reach the seawater. This assumption may be too strict, but it is simple to calculate and represents a good basic evaluation of the maximum, potential pollutant loads reaching the Mediterranean.

Under this basal assumption, the amount of pollutants deposited into the Mediterranean is mainly dependent on wind direction. Air pollution will be carried and deposited onto the sea surface only with an adequate wind component and sufficient wind speed depending on the location of the source. The evaluation is based on a sea/land factor which is multiplied by the pollutant load of all sources according to their location.

The determination of sea/land factors includes several steps:

- 1 Partitioning the air basin for atmospheric emissions into several zones. Each zone should contain wind data (wind rose) from a single source (e.g. meteorological station) or an area-wide average.
- 2 Determining a minimal wind speed for areas that are not adjacent to the coastline (around 1 m/s). Every fraction of the wind rose below the minimal wind speed will not be considered as wind blowing to the Mediterranean. This is mostly true for particles settling and not for gases, but will be used for the general evaluation.
- 3 Determining a sea/land factor for every zone according to the fraction of time the wind blows towards the Mediterranean at a minimal speed. (e.g. if the wind blows towards the sea

- for half of the year, then only half of the atmospheric emissions from that zone will be deposited into the Mediterranean).
- 4 Allocating a sea/land factor to every emission source according to the zones defined in step 1 or according to the closest wind data source. This can be done easily using a GIS software.
 - 5 Multiplying all emission loads by their allocated sea/land factor.

3.5. Consolidating the NBB database

After all available data has been collected, it has to be summarized to obtain the final pollutant loads. The following flow-chart (Figure 1) schematically illustrated the process of data processing and classification required to achieve a comprehensive assessment of the pollutant loads discharged into the Mediterranean. Orange boxes indicate the data processing activities, and the green boxes indicate the classification criteria's of the source categories.

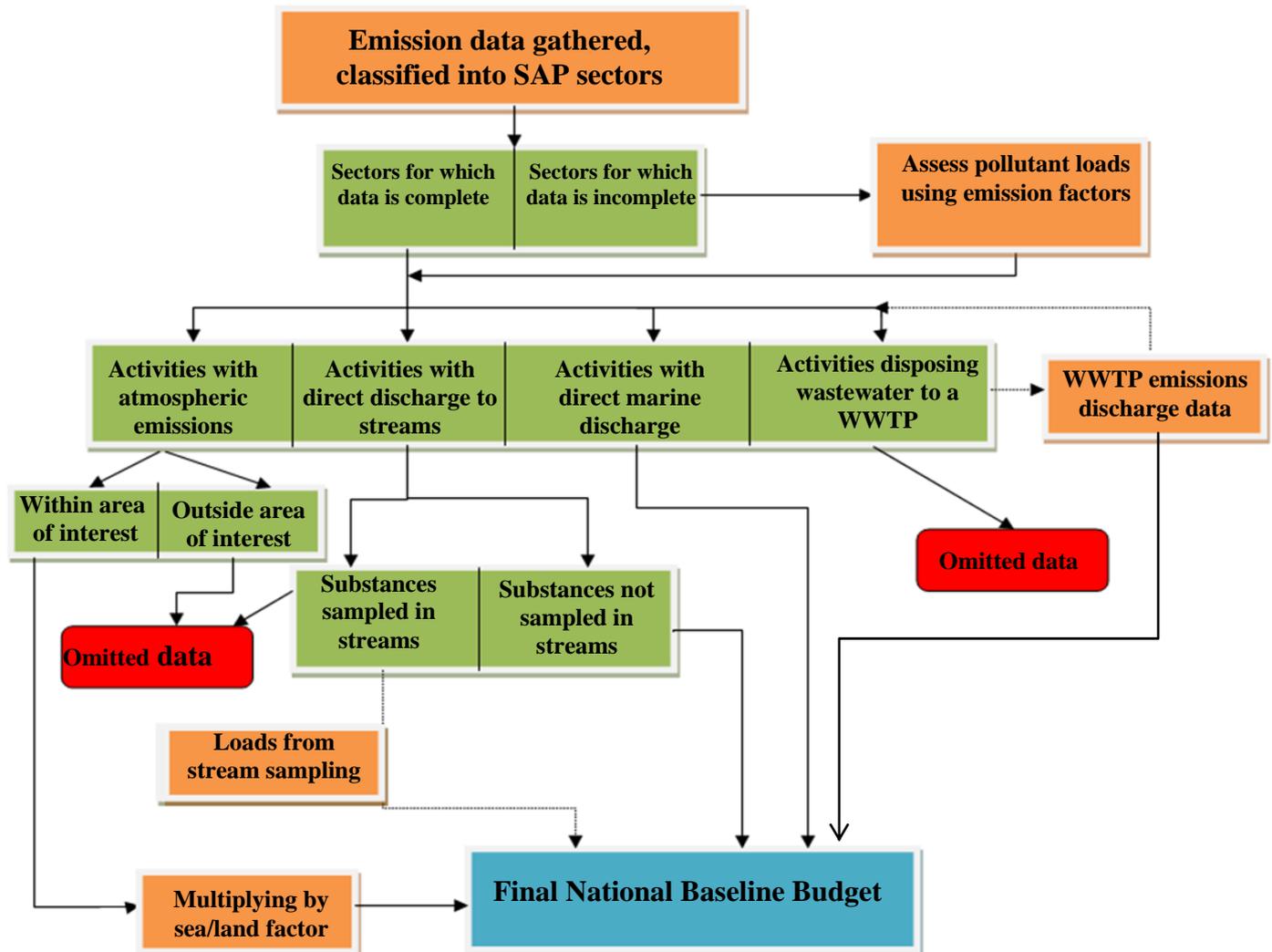


Figure 1: Flow chart of data processing and classification for the assessment of the pollutant loads discharged into the Mediterranean.

4. MED POL Info System on NBB

4.1. Introduction

In this section, the system design of the NBB-Info System, in the following the “system”, is briefly described. The “NBB Info System” is a networked information system that is intended to provide an overall support to NBB reporting and related assessment. The system provides tools for managing, sharing and preserving data and information for MEDPOL users and partners.

4.2. System overview

Interaction between the system and users can be described by functionality blocks, where implemented technologies are interconnected basing the focus on the logical functionalities they refer to. The logical view of the system is described in Figure 2.

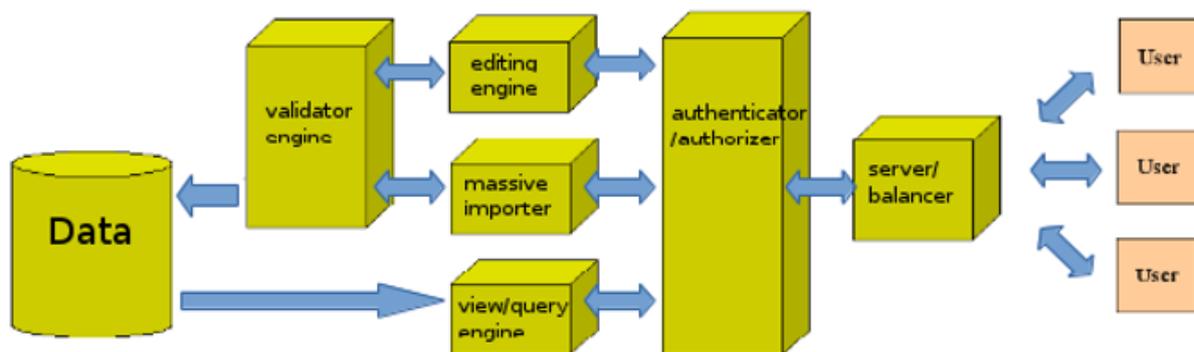


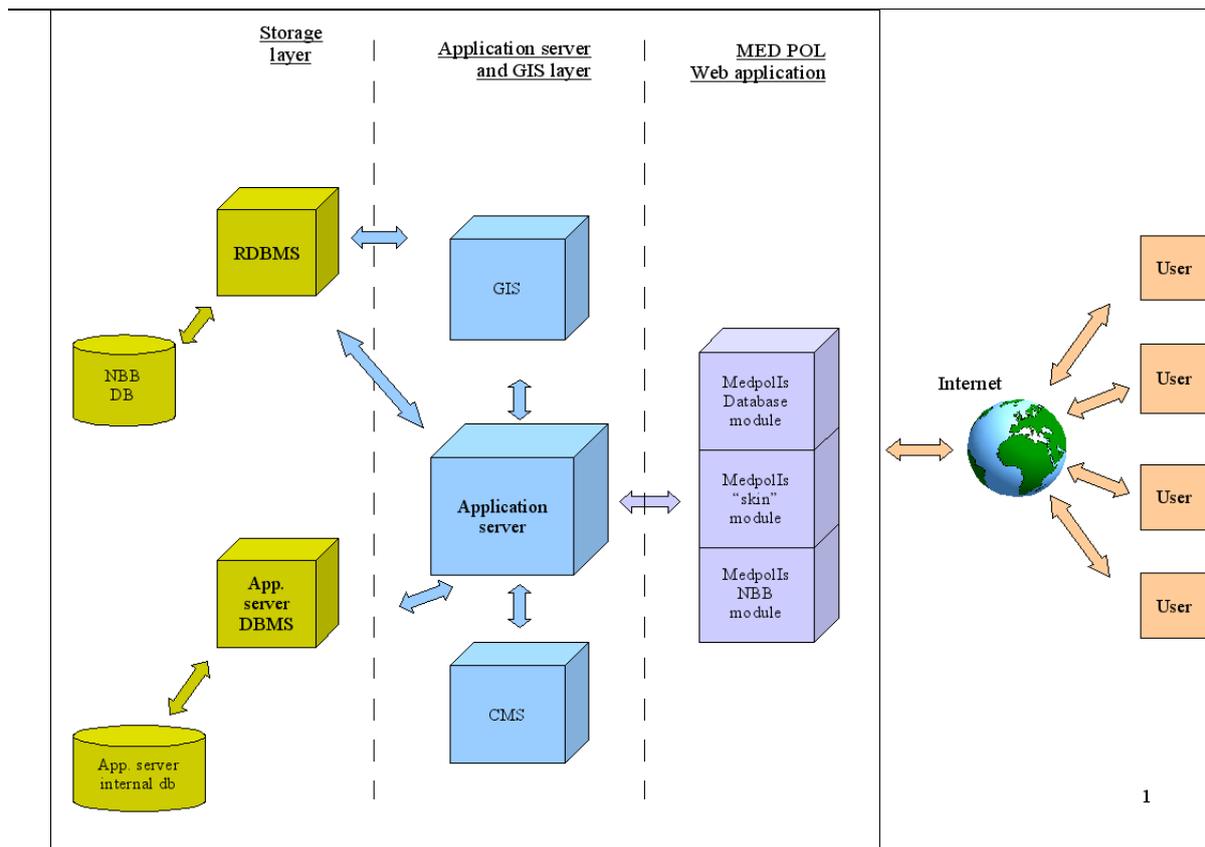
Figure 2: Logical architecture of NBB IS.

The system main components are:

- a storage layer, which manages data semantics, storage and retrieval;
- an application server and GIS layer;
- a dedicated MED POL Web application.

The system components are displayed in **Error! Reference source not found.**

Figure 3: NBB Info system Intranet architecture diagram.



4.3. User profiles and roles

Each user of MED POL Info system is given a definite role, which defines the amount of information/data and the kind of actions they are allowed to access. Role permissions can be modified as needed.

The user profiles are:

- System administrator: Unrestricted user management; user and data management; report creation;
- Data Definer: Unrestricted data access, editing, management, querying and distribution; some report management;
- Data Provider: data access, editing and querying restricted to user's own country data;
- Data validator: data access and querying restricted to the user's own country data; some report management;
- Anonymous: Data access and querying restricted to public data.

Any user will be given a user name and a password.

System administrator and Data Definer are reserved to MED POL members.

Data Provider is reserved to each specific country user to manage drafts of new data and searching/analysing of submitted data.

Data Validator is reserved to the National Focal Point for each country; this profile is responsible of official submission of new data.

Anonymous is the profile reserved for not logged users.

4.4. NBB Database description

NBB data are stored into the NBB database. The structure of NBB database is shown in **Error! Not a valid bookmark self-reference..**

The Database has several users access points, according to the different roles in the data reporting. The main entities corresponding to the different data types which can be managed by the database are:

- reports (table report),
- facilities (table company),
- value of the pollutant (table budge baseline).

The hierarchical structure is the following:

The report is the envelope which encases all the data of a single country. It contains several measures of pollutants, organized in the region where the measures has been performed. Each measure can be associated to a facility

Among the attributes of a specific measure, there are:

- pollutant (table pollutant),
- unit of measure (table unit),
- the hierarchical tern sector- subsector-process (tables sector, sub sector, process),
- the region (table region).

The geographical features of the NBB is at moment limited to the geometry of the region, which is included in the system in order to provide geographical queries (in the upload of PRTR values, the system performs a determination of the region from the geo coordinates of the PRTR facility).

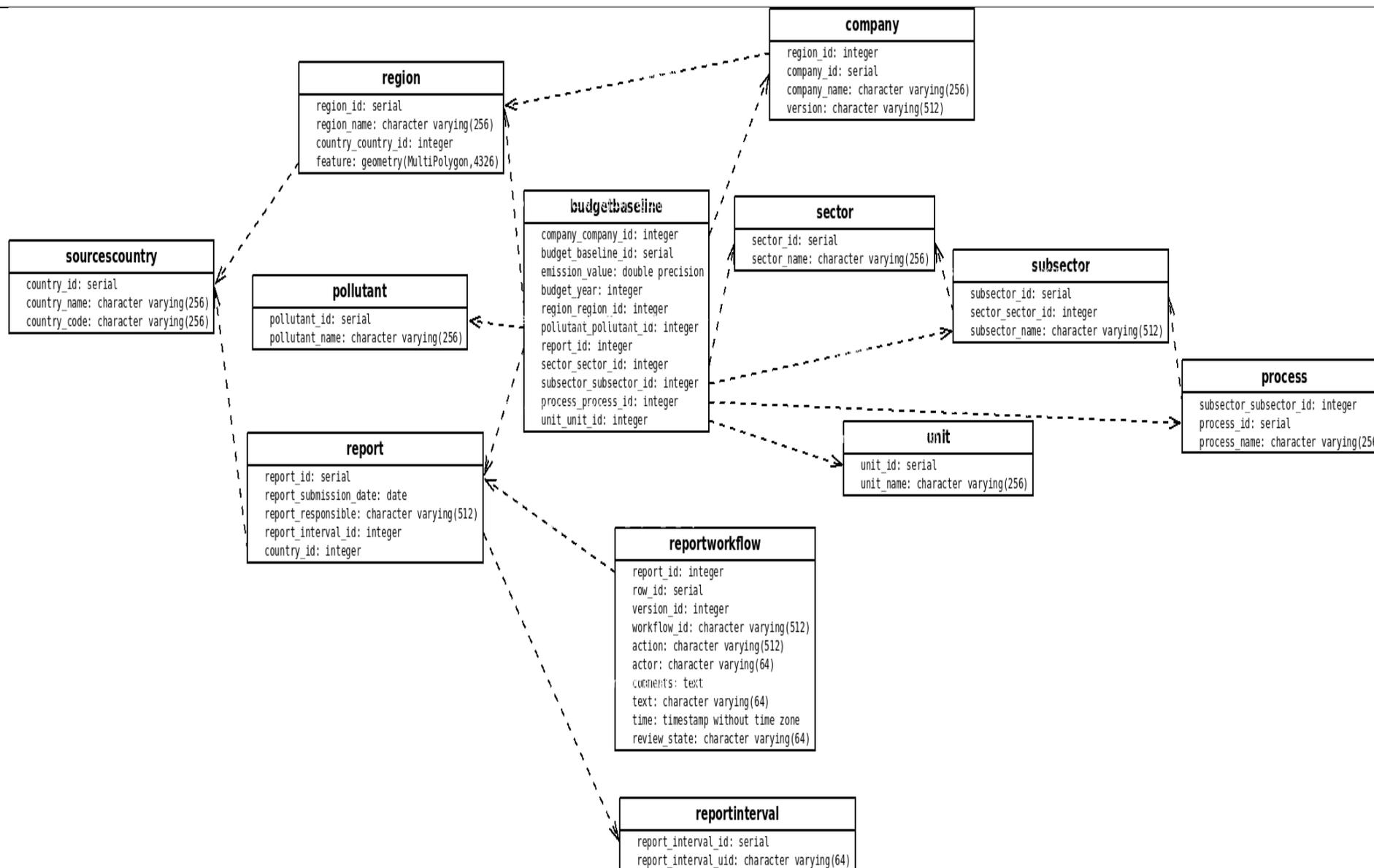


Figure 3: Structure of the NBB database.

4.5. Reporting data flow

The reporting activity is the main target of the NBB Info System. The data flow is sketched in Figure 4. It is organized in the following main activities:

- initial creation of an empty report in a draft state by the MED POL staff/Data Validator (National Focal Point),
- entry of the facilities by the Data Provider,
- filling and editing of the report and change of state to official submission (performed by Data Provider and Data Validator). It is implemented an intermediate final state for the report in order to facilitate the management of the report among the Data Provider and Data Validator. Once the Data Provider has completed the data entry in the draft state, he can change the state of the report from draft to final. In this state the report is managed only by the Data Validator (usually the National Focal Point) in charge for the validation of the data entered. If the Data Validator needs to change/modify the data and needs the
- support from the Data Provider can revert the state of the report to Draft too allow the Data Provider to access to the Report and starting a new session of data entry,
- Report workflow managing which include 4 states (draft, final, officially submitted and archived) and allows to manage the data flow among Data Provider, Data Validator and Data Definer/MED POL staff.
- Data validated are always stored into the database, but at the same time linked to the corresponding report (which contains them from a logical point of view) and to its state.
- The sections of query and statistical analysis, available in specific sections of the system, refer always to the data stored into the database and belonging to the report officially submitted and archived.

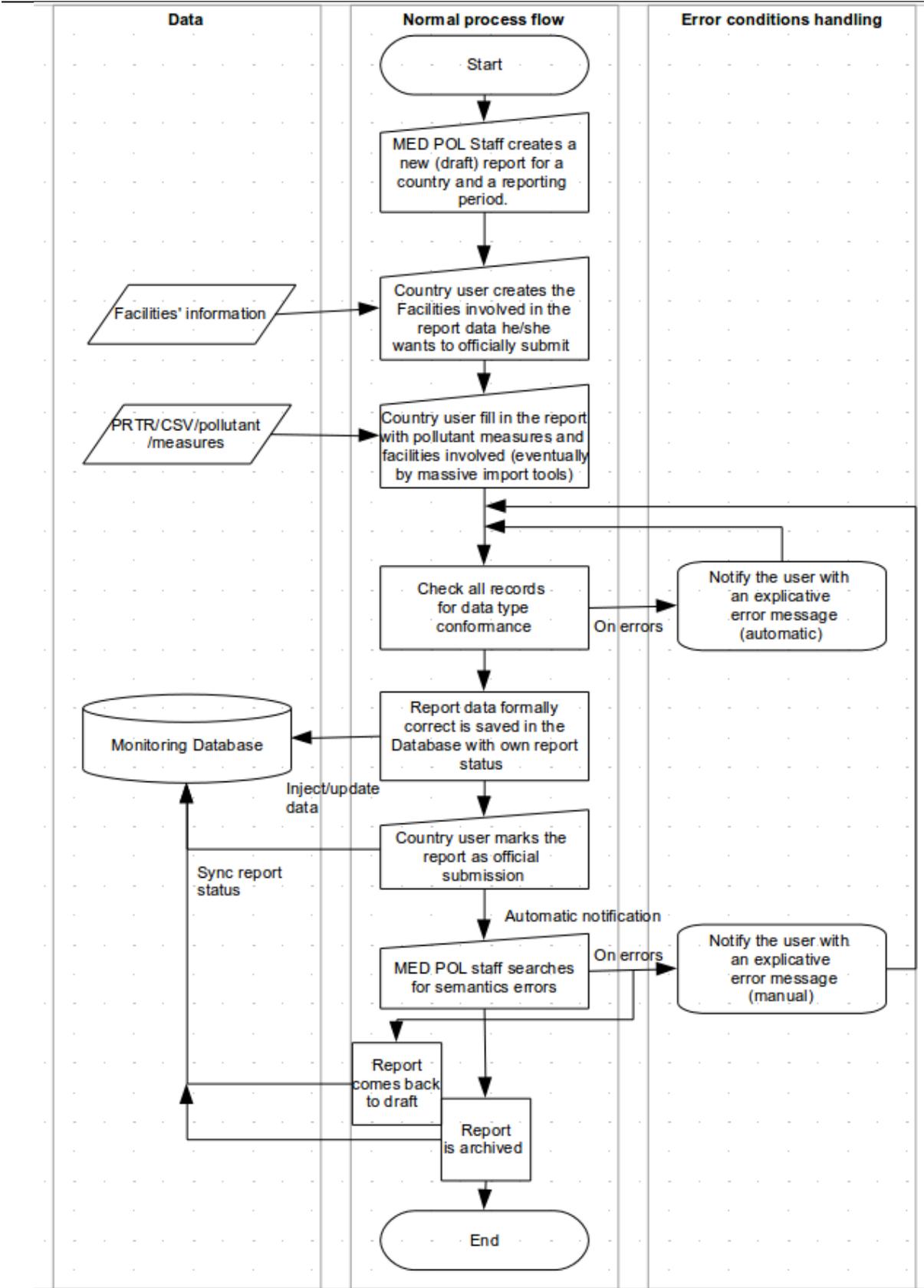


Figure 4: Data flow in the NBB IS Intranet.

4.5.1. H2020 indicators

H2020 indicators are visualized in the public section of the system. The public section has the same structure of the other sections, but it can be accessed by the anonymous users without password. H2020 indicators are organised in national folders and data can be downloaded as csv files.

The public section will include the link to the EEA webpage with the H2020 indicators. Similarly, the EEA webpage will host a link to the corresponding public page of the MED POL Info System.

4.6. GUI – System Functionalities/Modules

“NBB-IS System” GUI is designed to give quick access to most of the system functionalities and modules. Figure 6 shows a schematic illustration of the GUI typical areas (the figure refers to the Sources Data page).

Area 1 contains links to the system main sections ('navigation tabs') and the path to the current position inside the system. Area 2 is the system header, the same all over the system. Area 3 is the system 'navigation box', that is the main tool to move through the web pages of the system. Area 4 represents the content area of the current page: its content depends of the context. At last, area 5 displays personal user information/links, if login procedure was done, else the link to the login page.

4.6.1. Import process design

(a) Importing from PRTR XML file

The system accounts for the data upload from the MED POL PRTR and EPRTR XML files.

However, since the two systems are quite different and not fully interoperable, the implementation is still on-going. The system upload a subset of PRTR data which can be fitted in the data specifications of the NBB. In order to allow the upload of the data, we are performing a mapping between the data dictionaries of the system, which is still in the process.

Mapping has been performed for:

- Sectors,
- subset of subsectors,
- subset of pollutants.



Figure 5: GUI of the NBB-IS Intranet: main elements.

5. NBB and E-PRTR harmonization

The conceptual and technical adjustments for harmonization between NBB and E-PRTR are summarized as follows:

1. To select/filter only regions and river basin districts located in drainage basins that outflow into the Mediterranean.
2. To omit records regarding indirect emissions (going to an external treatment plant).
3. To compare the sector and subsectors dictionaries under NBB and under PRTR in order to identify the corresponding loads source categories and to identify not fully matching sectors/subsectors or sectors/subsectors under NBB which are not included under PRTR. Consequently:
 - dictionary entries not corresponding to any coded item in any list should be left in the NBB dictionaries;
 - the sector dictionaries are the union of the PRTR and NBB sector dictionaries;
 - for a specific sector the subsectors dictionaries are the union of the PRTR and NBB subsectors dictionaries;
4. To gather all emission data from industrial facilities regardless of specific capacity thresholds set by Annex I of E-PRTR Regulation or, alternatively, ensure that data collected are representative of the total discharges from such sector/subsector at national level, i.e.:
 - For NBB reporting purposes, it is recommended neither to adopt E-PRTR capacity thresholds nor to set national capacity thresholds.
 - If national capacity thresholds are set, to ensure that emissions gathered from each industrial sector/subsector in the country are representative of the total sector/subsector emissions in the country, i.e. they are at least 80% of the total emissions per sector/subsector. It is then up to each country to set such national capacity thresholds.
5. To compare the pollutant dictionaries under NBB and under PRTR in order to identify the corresponding loads of pollutants and to identify not matching pollutants.
 - dictionary entries not corresponding to any coded item in any list should be left in the NBB dictionaries;
 - the pollutant dictionaries in the NBB are the union of the PRTR and NBB pollutant dictionaries.
6. To gather all emission data from industrial facilities regardless of specific pollutant thresholds set by Annex II of E-PRTR Regulation or, alternatively, ensure that data collected are representative of the total discharges from such pollutants at national level, i.e.:
 - For NBB reporting purposes it is recommended neither to adopt E-PRTR pollutant thresholds nor to set national pollutant thresholds.
 - If national pollutant thresholds are set, to ensure that pollutant emissions gathered in the country are representative of the total pollutant emissions in the country, i.e. they are at least 80% of the total emissions per pollutant. It is then up to each country to set such specific pollutant thresholds.
7. In order to assure the coherency among NBB data and PRTR it is proposed to use in the NBB the same codification of the method of estimation of emissions used in the PRTR. For the sectors which do not allow the PRTR coding it is proposed to add a text field where the operator can draft the estimation method used.

8. The system should allow the prefilling of a new NBB report. This is thought to facilitate the reporting process for the following years since the operator will be able to readily check the values in the old report and update them in the new report, without retyping all from the beginning.
9. PRTR data can be massively uploaded from an XML into the database. However, since PRTR data provide only a portion of the NBB data, the solution envisaged is to allow 2 different types of prefilling:
 - prefilling of every data, using the old NBB data. In this case the Data Provider can recover all the NBB data and then update them to create the new NBB report.
 - prefilling of the old PRTR data. In this case the Data Provider can recover only the PRTR portion of the NBB data and then update only the integration to the PRTR data in order to create the new NBB data.

Moreover, the system allows adding data with the same attributes (sector, subsector, pollutant, region etc.) and only at the submission will perform the aggregation. In such a way, it is possible to integrate (adding simply a new record) data upload corresponding to a partial load.

6. References

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