

AIDA – INTEGRATED INTERNET WASTE INFORMATION SYSTEM IN NORTH RHINE-WESTPHALIA / GERMANY - A USEFUL TOOL FOR WASTE OWNERS, PUBLIC AND STATE AUTHORITIES

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SUMMARY : In October 2003, the North Rhine-Westphalian State Environment Agency published an integrated Internet Waste Information System for waste owners, facility operators, waste traders and interested public, called AIDA. This is the abbreviation for “**Abfall-Informationen-Datendrehscheibe**“ (waste information data turntable). AIDA is the most comprehensive research tool for waste management information ever provided to the public and to the authorities in a highly industrialized European region. This “data turntable“ provides waste owners characterizations, waste treatment plant identifications, waste analysis information and waste volume data, in German language and for the Federal State of North Rhine-Westphalia only. Additionally, definitions and basic information on the procedures applied (glossary) as well as the related catalogues (e.g. trade catalogues and European waste catalogue, the list of European Recycling (R) and Disposal (D)-codes, information on districts and inhabitants, etc.) are included. Multi-choice search tools and geographical information system are integrated.

1. INTRODUCTION

One of the essential working fields of the State Environment Agency is the development, operation and evaluation of data bases, necessary for waste management authorities in North Rhine-Westphalia. Due to its high population density (18 mio inhabitants) and its important industry, North Rhine-Westphalia generates 25 % of German waste which is about 75 mio tons per year, 6.2 of which are hazardous and 18.5 are municipal waste. More than 3000 waste recovery and disposal plants are in operation. Considerable data have to be managed, a fact that required automatic data handling early already.

Usually, two types of data bases were used:

- Data bases installed for supporting responsible waste authorities in the execution and supervision of legal obligations (LO) of waste owners and

- information systems originally installed within the State Agency for easier data collection and handling (IS). In the meantime, these data bases evolved to important waste management information systems for the whole of waste administration.

The most important data bases used in the North Rhine-Westphalian waste administration are described below (table 1).

Essential requirements for modern data management are user-friendly web applications which are run capable in the Internet and which guarantee the necessary data protection via a user administration. This statement considers the fact that, nowadays, the required data are almost exclusively generated by waste owners, plant operators and privatized disposal companies. These data have to be centrally collected in the State Environment Agency in order to redistribute them to the competent waste management authorities. As these web-applications are based on previous versions in ACCESS, they were computed according to the user-friendly appearance of Windows applications.

Table 1: Important data bases of the North Rhine-Westphalian waste administration

Name of data base	Description of data base	Type	Realisation
ABANDA	Waste composition / waste analysis data	IS	ORACLE, WEB
ABILA	Municipal waste balances	LO	ORACLE, WEB
ADDIS	Landfill control system	LO	INGRES
AMEDA	Waste quantities of waste owners and municipalities	IS	ACCESS
ASYS	Hazardous waste control	LO	INGRES
ENADA	Waste recycling and disposal facility register	IS	ORACLE, WEB
LO = legally obliged data collection of authorities; IS = State Environment Agency in-house information system;			

In the year of 2000, the waste analysis data base **ABANDA** was our first web application to be converted from a mere access data base with the support of the Federal Ministry of Education and Research (BMBF). In 2003, the municipal waste data base **ABILA** and in 2004, the waste recycling and disposal facilities register ENADA followed.

Starting from these data sources, but navigating from one single surface, **AIDA**, the North Rhine-Westphalian Waste Information Data Turntable was established in order to provide all information to the responsible authorities and to the public.

In order to visualize all information available on the quantity of waste processed in a treatment facility (input and output) or generated by private or public waste owners, it was necessary to create **AMEDA**, the data base of waste quantities and related waste owners (see also MORSTADT & STRIEGEL, SARDINIA 2003).

2. OBJECTIVES OF AIDA

The data turntable aims at

- providing the competent authorities quickly and completely with the data required,
- providing the public with data on waste management in North Rhine-Westphalia almost as completely and comprehensively as the authorities,

- visualizing and comparing related data in order to contribute to a standardization, to improve the enforcement procedures and to reduce the reporting requirements, as well as at
- obtaining improved data at medium term which also permit comparative evaluations of the ecological balance of regions, plants and technical conceptions.

3. ACCESS TO AIDA

A two-stage procedure was agreed upon: In December 2002, an **Intranet** version for the environmental authorities was completed in the administrative network (<http://lv.lua.nrw.de>). Since that time, it has been successfully applied by the State's ministry of environment, the five regional environment authorities and the 54 municipal environment entities. In October 2003, the **Internet** version was made available to the public (www.nrw-luawebapps.de). It is largely the same as the first version; with regard to the protection of data privacy, it has in some areas (waste volumes and waste chemistry) been restricted to aggregate data which can no longer be attributed to the individual waste owners.

4. INFORMATION IN AIDA

AIDA is the superordinate data processing element, the so-called "data turntable" that controls access to the data provided in the large number of specialized data banks for the creation of a common and uniform data pool.

The visualization of the data is structured according to waste owners (addresses of generators and plant operators), plant identification and description, waste characterization and waste quantity data. A central requirement was the standardization of material designations (waste types) and plant designations to the extent that all data from subordinate systems (waste chemism, waste amount data, technical data) can be allocated to these basic elements "waste type" and "plant" and will thus be comparable. Only then, missing data, contradictions and redundant data will become evident. For these four items, master systems were defined, from which AIDA takes its information and to which other systems are referred to.

For explanation and as a further instrument of enforcement, definitions and basic information on the procedures applied (glossary) and the related catalogues (waste catalogue, NACE-keys, the R-/D-codes, related information on municipalities etc.) were included in AIDA as well.

5. FUNCTIONAL STRUCTURE OF AIDA

AIDA collects the required basic data from the "reference systems" ENADA (for the disposal plants) and ASYS (for the waste producers). Due to the fact that all sites and factories are indicated in the pollution control information system (*Informationssystem Stoffe und Anlagen, in short: ISA*) with a so-called "workplace number" and the additional subordinate "plant number" and as the ISA-data likewise include an abundance of additional information on waste management, we decided that these "units" should be the common reference for the definition of a "waste treatment facility". That means: the waste recycling and disposal plants were clearly allocated to these ISA-workplaces and plants.

Illustration 1 shows the internal and external linkage of data objects in AIDA. The pattern leaves the structures of the individual data bases unchanged and permits easy transfer of objects from

the different data bases to the central AIDA data pool. Illustrations 2 and 3 show the functional structure and the contents of AIDA.

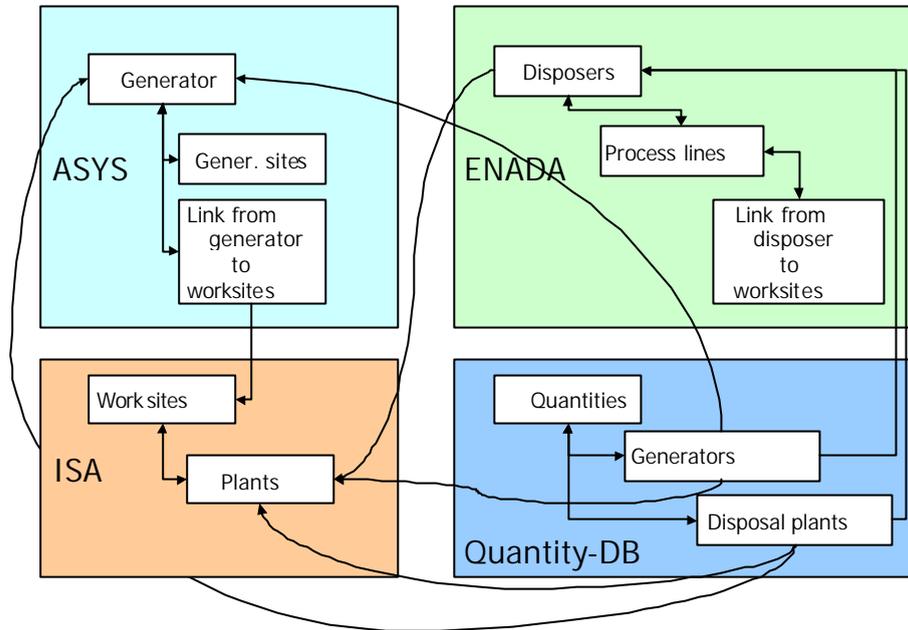


Illustration 1: Logical data pattern of AIDA

Via geographical or thematic criteria like plant type, industrial branch or treated waste types, research for waste generators, treatment facilities and worksites is possible. In this way, user-controlled lists of waste disposal plants according to individual features can be generated as well. The essential “basic“ data are then compiled in the form of brief descriptions. By way of a link to the waste quantity data base **AMEDA**, all data related to one waste owner are then available, listed up according to the individual years and data sources. This makes comparison of the different (sometimes contradictory) figures easy. In the meantime, all waste quantity data from surveys of the waste management administration conducted since 1994 are collected in AMEDA and are made available in AIDA in a multitude of evaluations.

The waste analysis data base **ABANDA** was integrated into AIDA as well and is thus available in the internet from now on.

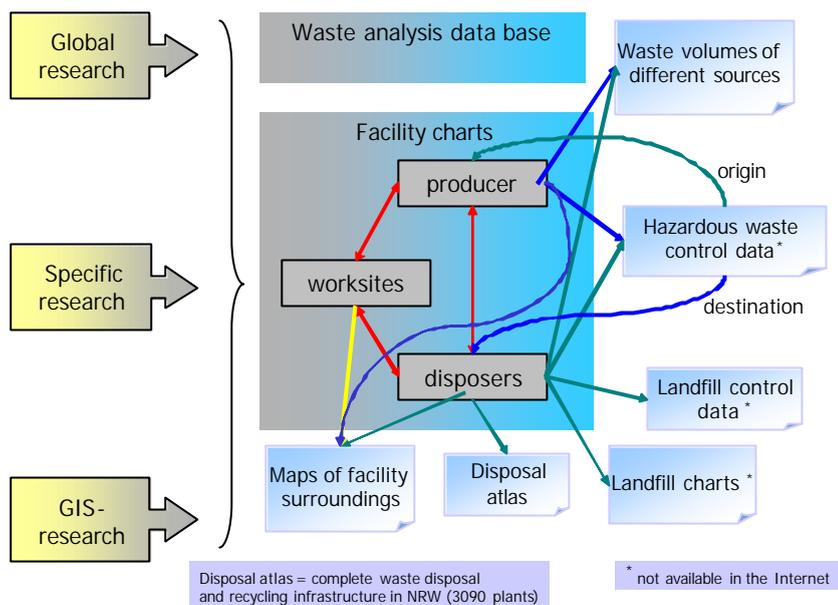


Illustration 2: Functional structure (Sitemap) of AIDA



Research for waste producers, disposers and workplaces via geographical, thematic or systematic criteria and representation of the essential data of waste owners in brief descriptions.

User-controlled production of lists of waste disposal plants on the basis of individual features (e.g. admissible waste type or processed waste group) with links to the brief descriptions and related waste volumes.

Statistical evaluations from ABANDA, the waste analysis data base, with limit value adjustment.

Consideration of the waste volumes data base, which, on the one hand, provides all volume data of a waste owner together with the respective sources and thus enables a comparison of the figures among themselves and, on the other hand, permits source-related state wide aggregations of the volumes produced or disposed of according to waste groups.

Illustration 3: Waste Management Data Research with AIDA

6 MASTERSYSTEMS FEEDING AIDA

6.1 Material flow data in AMEDA, the waste amount database

One of the essential aspects considered in waste administration has always been the amount of waste treated or generated (input and output data). With a comparison of capacity and input data, important information can be deduced for planning purposes and rentability reflections. The more waste treatment is effected by privately-owned companies, the more figures with regional relevance are expected to be provided by public institutions for further private activities and investment!

Quickly, it became necessary to compare these figures to other potentially contradictory data referring to the same matter, but originating from other sources. Therefore, a new data base directly related to the facility register ENADA was created, the so-called waste amount database AMEDA (ACCESS). In this data base, all data dealing with waste quantities in disposal and recovery facilities as well as referring to waste generators are collected and sorted according to the data source, year, generator, respectively the waste facility (and sub-unit), the waste type (EWC-Code) and the recycling and disposal activity realized (R-/D-codes). This main data pool primarily aimed at making all generator- and facility-related input and output data available for comparative evaluations and state wide aggregations.

Up to now, approx. 310,000 data sets have been recorded for the period from 1989 to 2002. These data sets originated from 12 different data sources. These sources (import/export control, hazardous waste control, sewage sludge report, domestic waste balance, Dual Refuse System Report, emission control register, landfill control system etc.) are closely related to different legal backgrounds, different authorities and their well-adjusted data collection instruments. None is complete, several are overlapping; always with the risk of gaps and contradictions. AMEDA for the first time permits an analysis of these figures (and their legal framework) which resulted in the first complete balance of waste disposal activities in NRW, published in the waste disposal and recovery atlas (see MORSTADT & STRIEGEL, SARDINIA 2003).

6.2 ENADA – the data base on waste recovery and disposal plants

ENADA is the data base central register of waste disposal and recovery plants processed by the North Rhine-Westphalian State Environment Agency and grown throughout 15 years. The data base records data of all approx. 3,100 waste disposal and recovery plants in North Rhine-Westphalia, including those industrial facilities reusing such waste material (plastics industry, foundries, cement kilns, etc). The documentation of the present status of the plants (skipped, in operation and planned) gives a clear picture of the development of the waste disposal infrastructure during the last 15 years. The database ENADA is an ACCESS data base, now in transition to ORACLE; it offers a user-friendly visualization and all usual access tools for evaluation.

The register is based on the data from permissions and other administrative documents relating to waste disposal and recovery facilities and submitted in copy to the State Environment Agency, from other data base systems as e.g. the emission control register and - additionally - from our own investigation carried out by means of questionnaires completed by plant operators.

The database contains information on the operator, on the site and on the authorities in charge; it lists main data of permissions, for example, authorized waste catalogue and authorized (as well as realized) capacity of the plant, it fixes important technical elements including their performance (illustration 4). In the same way as the differentiation of the operator's services to clients increased, the internal subdivision of the plants into independent subsystems increased as

well. These so-called “process lines“ (independent subsystems for different material streams within a disposal plant) are particularly important for the correct registration of waste streams in the data base and so far essential for correct evaluations and state wide aggregations.

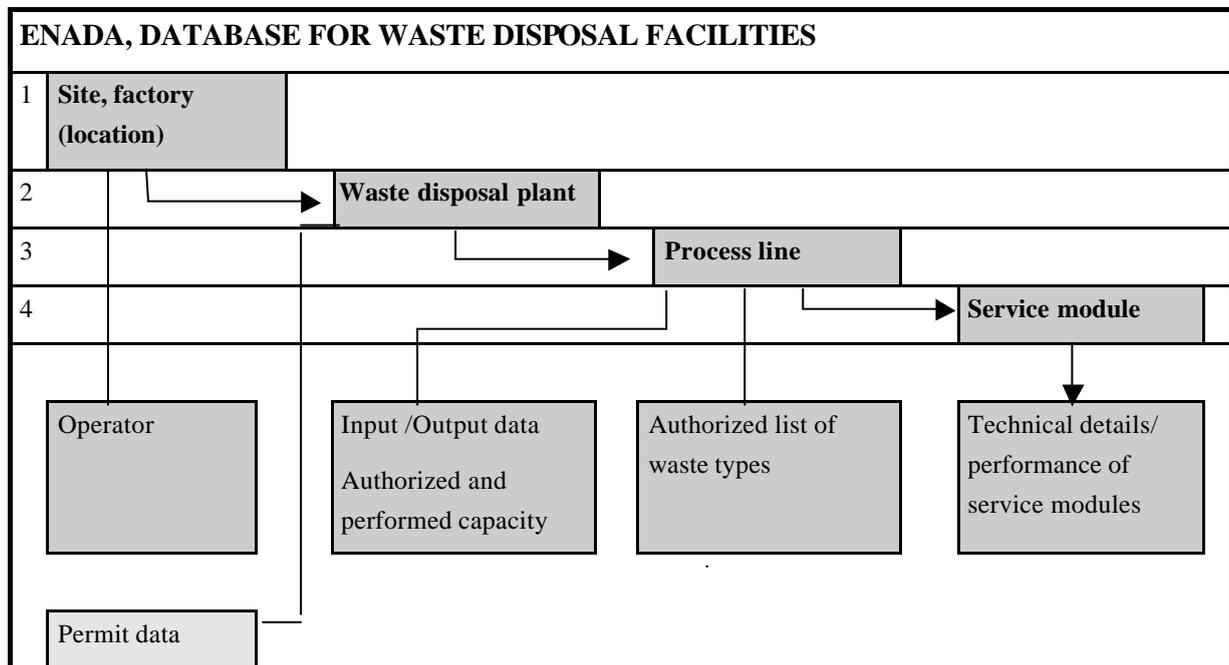


Illustration 4 : Structure and contents of ENADA

From the beginning, these technical data have been one of the essential aspects of the waste disposal register. Systematic evaluations of all types of treatment techniques implemented in NRW can now be extracted from this data base (see MORSTADT & STRIEGEL, SARDINIA 2003).

6.3 ABANDA - the web-based data base on waste composition and waste analysis

Knowledge of material composition plays an important part in waste evaluation and decision-making for technical waste disposal options. For this reason, the waste analysis data base ABANDA was developed in North Rhine-Westphalia 10 years ago as an aid for waste assessment.

ABANDA collects, orders and stores the data available on waste composition and analysis – always referred to the individual waste types, their origin and location. The data base furthermore includes sets of rules and regulations with limiting chemical parameters from the environmental fields of soil/contaminated sites, water and waste management which are an important criterion for waste assessment. In order to make communication and data management easier, a browser-compatible data base version of ABANDA was developed in 2000 on the basis of the original MS Access data base.

ABANDA consists of the modules

- data input/data view,
- data processing and evaluation,
- data base maintenance/import of data and
- data base management.

The data from waste analysis are arranged according to the waste types specified in the European Waste Catalogue (EWC) and grouped as so-called waste reports. These reports include data on the chemical-physical waste composition and information on waste origin and location which additionally characterizes the data set. The analysis data of each waste sample are stored in a separate list of values indicating the test type, the analysis parameters, the measuring value and, if known, the method of analysis.

At present (status October 2003), 16,574 waste reports for 29,209 samples with 434,498 measuring values are available. The data base includes 267 limit/standard value lists taken from 84 different sets of rules and regulations. The data provide a characterization of 445 out of 839 waste types included in the EWC. ABANDA puts the main emphasis on hazardous waste, as the main data source is represented by the declaration analyses of hazardous waste disposal certificates (66 % of the waste data included). Waste analyses of other waste are less common. Further data sources are files from North Rhine-Westphalian authorities, waste expertises referring to special problems (e.g. waste-to-fuel-projects), laboratory data from the environmental administration of North Rhine-Westphalia, licensing procedures, literature research, surveys on disposal plants and other sources (each with a portion of 2 to 7%).

Since 2001, the application of the browser-compatible data base version of ABANDA throughout the whole of Germany has been examined within the framework of a research project of the Federal Ministry of Education and Research (BMBF). The cooperation with the fifteen federal states aims at up-dating and supplementing the existing data stock as well as at improving the specialized communication between the federal states. Within the context of this project, Lower Saxony, Saxony and Hesse could be won as participants in the ABANDA data compound. For other states, as e.g. Thuringia and Rhineland-Palatinate, ABANDA read access was first of all provided.

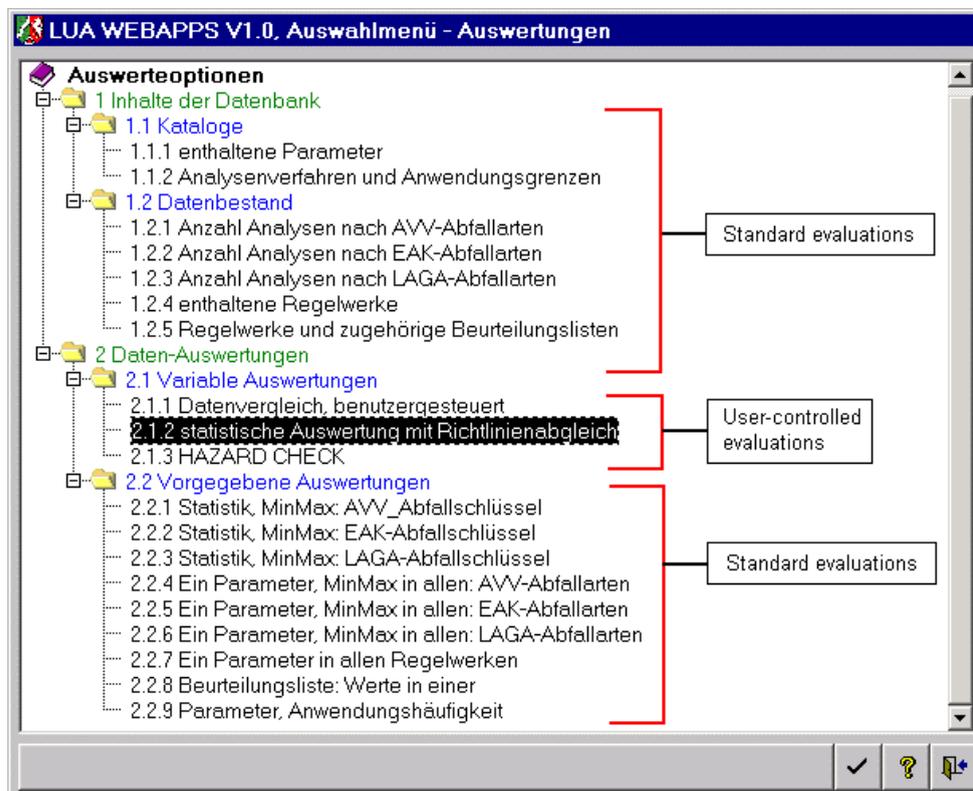


Illustration 5: ABANDA analysis evaluation menu

The waste analysis data base provides a multitude of evaluation possibilities (illustration 5), now integrated in AIDA. A distinction can be made between standard evaluations and user-controlled evaluations. Standard evaluations provide a printable report after selection of one criterion, which is the waste type, whereas user-controlled evaluations lead to individual results after selection of several criteria determined in different processing steps (e.g. period, region, industrial branch, type of plant).

An evaluation option frequently used is the user-controlled limit value comparison. A list of limit values is determined as a so-called “reference“ and subsequently compared to the statistical analysis of a waste type chosen. Here, the statistical functions (e.g. 50-Q-percentile) can be adjusted by the user. Exceeded limit values are shown in grey-coloured fields.

An interface for data export to external programs (Excel) has been realized as well. Further processing, for example, the graphical result representation, is thus enabled.

7. OUTLOOK

From 2002 onwards, the European Guideline for Integrated Environmental Control (IVU-directive) demands from all member states to provide reports on the emission of pollutant substances in order to submit them to the European Commission for publication. Operators of regionally important landfills and waste treatment plants are obliged to deliver this information as well. This European Pollutants Emission Register (EPER) is, however, valid for airborne and waterborne pollutants only. For the completion of the “emission register“ and for the preparation of input/output balances, North Rhine-Westphalia intends to register pollution from waste streams as well. Starting point of this project are the waste recovery and disposal plants.

Only the completion of the EPER-reports and the systematic collection of waste stream and pollutant flow data by treatment plants will provide an integral view of the material flow through treatment and disposal facilities and so far complete with the IVU demands. With these new data, the transfer of pollutants into products as well as into the environment will become more evident. Additionally, these data can help to measure the efficiency of reprocessing and recycling in terms of canalizing pollutants to safe confinement or destruction and to keep secondary raw material free from pollutant substances. This attempt is confirmed by the draft of the UN convention of Aarhus to PRTR (pollutant and transfer register).

Regarding this development, the future role of AIDA becomes clearer: in addition to the data sets already collected, plant-specific environmental indicators like transfer coefficients will have to be determined, collected and evaluated in order to measure the ecological relevance of disposal options and to promote the further development of waste treatment techniques. These additional plant-specific data must, for example, permit

- a comparison of the realized treatment techniques with the requirements of an optimized closed commercial and industrial substance waste management,
- a determination of the degree of the pollutant expulsion from material recycling processes
- a preparation of energy balances of waste processing plants and
- access to information on the degree of the achieved raw material substitution.

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