

Making information on the living environment available

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Abstract

There is a strong societal need for information on the conditions of the living environment. Environment, health and safety are important factors for our social well being. Therefore the Ministry of Housing, Spatial Planning and the Environment (VROM) in the Netherlands started a project called “Atlas Of the Living Environment” to make information on this subject available for professionals and citizens (the users). This is also encouraged by the fact that the Sixth Environment Action Programme (EAP) of the European Community (2002-2012) is the Community’s Strategy for sustainable development. From the seven strategies in the 6th EAP Air, Natural Resources and the Urban Environment amongst others are important driving forces for setting up the “Atlas Of the Living Environment” website. This website is meant to demonstrate the use of distributed web services from national, regional and local governmental organisations to bring together all data sources in order to provide adequate information on the living environment for the users.

This process dealt with content, user and technical aspects. For the content it meant that the different involved parties have to reach commitment on what the information should contain, what the desired quality should be and how it should be presented to the users in a meaningful way. Since information on the living environment is complex this was a time consuming process. For the moment, the demonstrator contains only parts that are well defined, but will be extended over the coming years.

To ensure that the website is in line with expected user needs an interaction design was made. From the user point of view the expected interaction is leading in the design and it is anticipated on having user information included to increase the value of the information content. The concept of social media was integrated in this design; thus users will be able to leave messages, to contact responsible authorities, to create personalised maps and add those to the website. Users can also form groups or communities to be able to achieve specific objectives, from discussing up to form action committees to support or oppose ongoing work in the neighbourhood.

On the technical side the services oriented architecture was used to create the technical infrastructure. In this way the distributed services could be brought together. For the demonstrator the national organisations and the selected pilot partners (three provinces and three municipalities) had to set up OGC web services (WMS) to provide their data. Since there is still little experience in this field some more or less obvious problems had to be solved. To mention a few, transparency and standardised styling must be properly configured.

The metadata of the datasets proved to be an important base for search capabilities. But next to the maps the website provided also a lot of linked textual information. These texts explained the topic presented. It appeared that also for these texts metadata were necessary to provide good search capabilities. Dublin

Core metadata elements were used for this purpose, and were able to map this adequately to the other metadata information.

The first results in evaluating the demonstrator show a few bottlenecks, like performance, uptime, styling, etc. Organising the data providing organisations is crucial. Also harmonisation is an ongoing process. Metadata efforts are still necessary, not only for spatial datasets, but also for related information of a non-spatial nature.

But distributed information brought together in a standardized way did result in an integrated geoportal providing useful information on the living environment, a solid base for further development.

Keywords: data integration, Web2.0, eGovernance, INSPIRE, Environment, Air quality, Noise pollution, Greenery, Standards, Services Oriented Architecture

1 ATLAS INTRODUCTION

The most important task of the Ministry of Housing, Spatial Planning and the Environment (VROM) is to create a pleasant living environment, to continue a spatial planning policy and contribute to a sustainable development. For that purpose information will be presented in an Atlas on the living environment on the web.

Professionals and citizens play an important role in decision making for new development in cities and neighbourhoods. But is adequate information available to make good decisions? And more important is that information easy to query and can it be used for comparisons? Especially comparison of data is still not possible. The Web Atlas can fill in that gap.

Good decisions are based on information. In a modern society it is the task of the government to present information on the quality of life, the environment and health in a transparent manner. According to the Aarhus¹ convention information should be equally available for all the citizens. National government, provinces and municipalities already have a lot of information available and in several cases made public through websites like De Milieuatlas Deventer (environment) , de Geluidkaart Nieuwegein (noise pollution), de Gezondheidsatlas voor regio Noord-Brabant en Zeeland (health), they all give good insight in specific topics of the living environment for a specific part of the Netherlands².

2 INTERNATIONAL CONTEXT

The “Atlas Of the Living Environment” project is all about making environmental information available for professionals and citizens (the users) and this is also encouraged by the Sixth Environment Action Programme of the European Community (2002-2012). The 6th EAP is the Community’s Strategy for sustainable development. From the seven strategies in the 6th EAP Air, Natural Resources and the Urban Environment amongst others are important driving forces for setting up the

¹ The Aarhus Convention (signed in 1998, in force since October 2001) grants the public rights regarding access to information, public participation and access to justice, in governmental decision-making processes on matters concerning the local, national and transboundary environment. It focuses on interactions between the public and public authorities

² De Milieuatlas Deventer → <http://82.197.222.112/kaartviewer/main.asp?FlexiHost=>; Geluidkaart Nieuwegein (noise pollution) → <http://www.nieuwegein.nl/infotype/pagelink/view.asp?objectID=4855>; Gezondheidsatlas voor regio Noord-Brabant en Zeeland (health), <http://www.ggdgezondheidsatlas.nl/>

“Atlas Of the Living Environment” website. Another important driver is the Directive for an INfrastructure for SPatial InfoRmation in Europe (INSPIRE). INSPIRE will build on the National Spatial Data Infrastructures (NSDI) of the EU Member States. The Atlas project started to build a Demonstrator using the INSPIRE principles. It is meant to demonstrate the use of distributed web services from national, regional and local governmental organisations to bring together all data sources in order to provide adequate information on the living environment for the users.

3 SETTING OF THE PROJECT

The project “Atlas Of the Living Environment” the Ministry of VROM wanted to improve the availability of this kind of information. Not only to present the raw data but also to make specific queries and comparisons possible. This will improve health, security and efficiency in decision-making. Think of industrial extension, spatial plans or to move house related to health issues (like asthma) and so on. The web Atlas on the living environment will help public authorities to make environmental information publicly available. Aarhus, PSI and INSPIRE, all these European directives force member states of the EU to do so. But also national ‘Freedom of Information’ legislation demands that information is publicly available. The realisation of the Web Atlas will offer technical facilities to public authorities comply with this legislation in a fairly easy way. By combining information of national government, provinces, municipalities, and water boards a coherent image for the quality of the living environment can be presented.

3.1 Parties involved

The project is initiated by the Dutch Minister Cramer of Housing, Spatial Planning and the Environment. In the first stage possibilities are explored for harmonizing and exchanging information between a limited number of municipalities and provinces (the pilot partners in the project).

In practice this means a cooperation between:

- the users (panels of citizens and professionals);
- scientific institutes such as the RIVM and Alterra;
- participating public authorities (the municipalities and provinces concerned);
- organisations which occupy themselves with developing an infrastructure for exchanging geo-information, such as Space for Geo-Information (RGI), GeoLoketten and Geonovum.

Starting point is a step by step development of the atlas, with interim evaluations of the possibilities. The first year is an exploring stage, carried out with a limited number of municipalities and provinces. In the autumn of 2008 the Atlas Demonstrator became available. This is a demonstration version to show what could be achieved. The results of this test phase are evaluated. Hereafter a further elaboration of the atlas, with new datasets and further up scaling must take place in the coming years.

Five working groups, headed by a project team, gave direction from several angles to the project. The working parties are:

1. presentation: among other things the information wishes of the potential users;
2. information: among other things to harmonise and combine data sets;
3. ICT;
4. organisation: participation to Atlas source holders;
5. legal matter.

The members of the working groups originate from VROM, provinces, municipalities and GGD (health services). The recommendations of the working groups have resulted, besides the terms of reference for the Atlas Demonstrator, in ten projects which must lead to answering the following questions:

- How can we make use of key registrations and national basic background values maps?
- Which possibilities are there to combine different data sets and maps?
- How does the 'layout' of the Web Atlas look like?
- What does the user want to use of the Atlas to take own actions?

The Atlas for the living environment is still in development. The Ministry of VROM is happy to see that a lot of parties involved are committed and willing to participate. They are the ones who make Aarhus work! If the Atlas is realized, the Dutch citizen and professional have access to a valuable resource that offers the possibility to make decisions on the basis of facts related to our health and the environment!

4 THE DEMONSTRATOR

For developing the Atlas Website we used experiences gained in the project Geoportal Network project (Geoloketten) in the Bsik research programme space for Geo-informatie (RGI). One of the common goals in this programme was to make geodata better accessible for a wider audience using the principle of INSPIRE to leave the data at the source. The appropriate way for that is the use of web services. GeoLoketten, one of the larger RGI projects worked on the realisation of web services to improve the spatial data infrastructure. The Atlas Demonstrator can be compared with the Living Environment Demonstrator (LOD) developed in the Geoportal Network Project with regard to functionality, target group and its specifications.. The Atlas Demonstrator is built using the experiences gained with the LOD work.

5 ARCHITECTURE

As mentioned earlier the architecture is services oriented. Basically it follows the set up of the architecture also defined by INSPIRE. The web client is a combination of a discovery, view and download geoportal. The application has been realized in three tiers, the data, services and application layer. All the services apply to the international standards set by OGC and ISO to obtain a maximum of operability. In Figure 1 an overview of this architecture is presented.

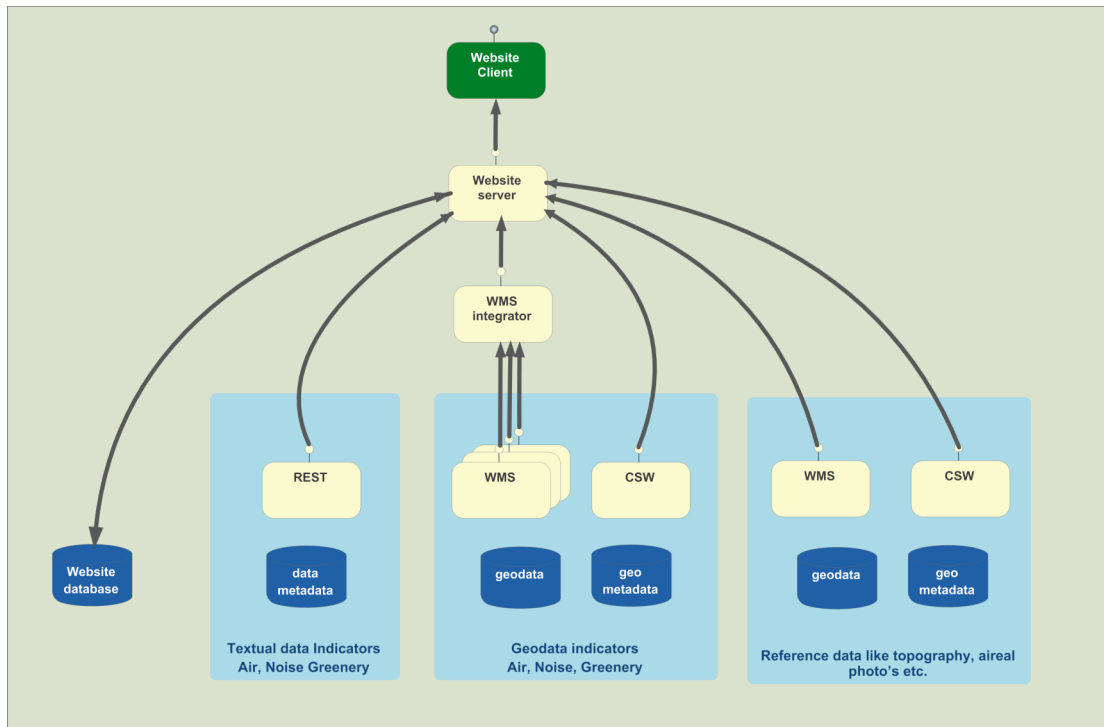


Figure 1 Atlas Demonstrator architecture

A major role has been put aside for data and metadata services. Metadata plays an important role to find the appropriate information in the published data services and also providing information on quality and use of the data. Since the Web Atlas can be considered to be a thematic website a lot of attention is paid to how to present the information in a clear way. Just standard metadata according to the Dutch profile of ISO19115/19139 was not adequate to provide all the necessary information because of specific thematic characteristics. We added extra metadata to provide information on themes and topics within themes. It offered means to present information based on text as well as on maps, depending on the search method used by the user. Special attention was given to integrate data services (WMS) serving the same data for different regions bordering or even overlapping each other. Integrating services demanded a specific way of making agreements with the data providers to be able to show the data in a map viewer in the same way. A well defined legend by a Styled Layer Descriptor (SLD) was used to harmonize geographic representation.

6 USER INTERACTION DESIGN

Providing information requires a well defined interaction design. It means that from a user point of view the information must be shaped comprehensible, and navigating or browsing in information sources should be intuitive to satisfy the user demands. Today user interaction design is a new specialism which is crucial for the success of a web portal. Even more when maps are involved since this is a very comprehensive and efficient, but also very different way of showing information. An interaction design describes how to interact with information, the structure of the information but also the means given to the user to navigate through information sources. It is presented in functional web page designs (so called wireframes) with the description of all the controls. It is not an operational set up, but indicates what the website should look like and how the web site 'works'. Once the design has been evaluated against the user needs it can be translated into a functional design, a visual design can be added and the application can be built accordingly. For the Atlas project the interaction design was an important step in the process. The information

and structure for the thematic geoportal is very complex and the user needs to cover a very broad range in the domain of this information. This meant that a lot of effort was put in the interaction design. It also meant that it was not that easy to come to a mutual agreement and understanding between users, designers, data providers and the project team on a final design.

The user interaction design is based on the principle that the user enters by selecting a location. Central thought is that the interest of the user is determined on specific information for an area. This can be the area he or she lives in, but also when a new homestead has to be selected and more similar cases. Once at the location of choice a theme has to be selected. This offers the user a variety of topics to choose from within the domain of the living environment. For the demonstrator the information provided is limited to air quality, noise pollution and the greenery, all items concerning health and social well being, the highest valued aspects of today's society. Having selected the subject of information a map is provided. But next to the map also in textual information is added which cannot be seen on or derived directly from the map. For clear communication the information is presented as an indicator on the chosen theme with it's own dedicated legend and classification. In the future the idea is to present additional more general indicators presenting the state on broader themes like health risks, social wellness and so on.

The set up of the interaction design also allows for a different approach. Instead of choosing a location, users may also go directly to the thematic part which shows more textual information and more generalized national maps. This does have the disadvantage of a more complex user interface but will result in serving a broader target group and offers more flexibility.

7 CONSTRUCTION AND TESTING

On paper the design is already worked out in an advanced manner. To realize the actual application will take a lot of effort. Providing and creating the content will probably take more effort than realizing the technical application. From a technical point of view, it looks like most of the wanted functionality can be realized. But since it has to comply to international standards as much as possible, there are still some major drawbacks to be expected regarding the performance of the application. Not only because of functionality on the server or the client side, but also in the performance of the connected services. In the initial set up this is an aggregation of all kind of services from different server environments present at the different data providers. This does support interoperability but not necessarily is it fine tuned to perform the task requested by the user. This will be a future research topic on how to improve performance satisfactory without leaving the principle of data at the source.

Main issues in the future are a proper harmonization of content, scaling properly in space and in time and tuning the operations on the data sets to obtain consistent, and reliable information. In that process also quality has to be used adequately related to the scale of use and propagation of uncertainty. In the process of construction these issues regularly came up and were solved in a way that it could be evaluated in the demonstrator. Issues too complicated and/or sensitive to propose an adequate solution for were set aside, to be worked on when realizing the real web site in the next stage.

These issues revealed the importance of the evaluation phase in the process. Thorough testing on usability, both semantically and technically, is crucial to describe the requirements necessary for building the final Web Atlas. The evaluation period is

still being carried out at the time of writing this paper, but first conclusions can already be drawn.

8 WEB CLIENT COMPONENT

The Atlas Demonstrator was developed using the Luigi framework. Luigi is a user-friendly internet GIS application framework which seamlessly integrates web services from different sources. End-users navigate to a website from where the internet GIS application created using the framework is downloaded. This application subsequently connects to the various web services as it should be for a services oriented architecture. Luigi was developed using the Adobe Flex development framework.

Adobe Flex is an independent platform for developing rich internet applications. The client platform for applications developed using the Flex SDK is either the Flash Player plug-in (for browser based applications), or the Adobe AIR runtime (for desktop applications). The Flex platform is quite suitable to develop highly interactive internet GIS applications like the one described here as:

- Flex is platform independent. Flex applications have to be developed for one platform only, the Flash platform.
- Flex applications can both run in a web browser, using the Adobe Flash Player or on the desktop, using the Adobe AIR runtime. Flash Player is available on 98.8% of the PC's in some countries.
- Flex offers a rich set of user interface components
- Flex offers a rich set of user interface effects
- Flex server calls are asynchronous. This allows users to continue to work with the application while the server is processing their requests.

The Flex client connects to an application server which has been developed using Ruby on Rails. Ruby on Rails is an open source web application framework for the Ruby programming language. The Flex client uses the XML output from the application server, but other output formats are also supported, for instance HTML. This allows for the development of alternatives for the Flex application, for instance for visually impaired users.

9 FIRST FINDINGS

There were some technical findings when the demonstrator was launched. Despite the strict styling rules agreement it appeared difficult to show a consistent image. Most of it caused by lack of experience in serving data through OGC services at one hand, but also the difficulty of showing direct results once services are created. Also sometimes services are serving other websites and/or purposes and styling were not adapted according to the rules. This resulted in different colours and styling. Sometimes transparency was used resulting in incomparable colours. In a few cases different legend classifications were used in combination with different ways of deriving data. In the Netherlands different noise models are allowed to be used to calculate noise pollution along roads. When bordering data services used different models abrupt changes appeared on the map.

A lot of effort is needed to add full and complete metadata on the different levels, the data set level and on the theme level. For the thematic level also different regional data sources had to provide their own regional metadata, if for a reason it needed to be different from the national description. Very little of this textual information was available and as a consequence did not show. It also appeared that services are not always up, resulting in partly missing data on the maps.

10 DISCUSSION AND FOLLOW UP

In our first findings there are already issues raised which need to be addressed to proceed to the next step, the stage of building the real web site. On the technical sites the topics are reasonable clear and a focus will lay on performance and up-time issues. Especially services provided by several data providers, which all have there own server environments, perform differently. And even more important service levels can vary significant. A facility, like for example caching or harvesting the services has to be worked out. Also the calculation of certain statistics on indicators for each chosen extent is a performance issue to be solved.

There is a more technical part concerning creating the services (data and metadata) and there is the part of creating the content. An important aspect will be the quality of the data suitability for the target group (public and professional). This will be a tough task since current experiences show that data owners are very reluctant to publish data if it's not 100% quality proof. In theory that's sounds ok, but in practice it means ample data sets will meet this criteria. Furthermore this is inconsistent with the fact that the data providers themselves use the data within there own organizations. The gap between expert use internally and the 'layman' use externally should be bridged to the extent that for the "Atlas Of the Living Environment" website useful information can be provided.

Providing adequate and complete content is a more important concern. This ranges from agreements on how to structure terms within the domain up to completion of metadata records on a local level. Especially the integrating indicators presenting general, clear and comprehensive values will need a lot of discussion amongst experts in the field.

The following stage will be as mentioned the realization of the real website. It starts by proposing solutions for the white spots identified during the evaluation of the demonstrator and will be continued in the process to be translated from interaction design to technical design and programming the application. In parallel much effort must be put in collecting and completing the content, organizing the stake holders and set up proper maintenance for the "Atlas Of the Living Environment" website once it is realized.

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