THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY TO DISSEMINATE GEOGRAPHIC INFORMATION FROM THE NORTHERN VOSGES REGIONAL NATURE PARK TERRITORIAL OBSERVATORY

Kévin DABERT[1], Aziz SERRADJ[2], Gabriel HIRLEMANN[3]

ABSTRACT:
The Northern Vosges, northern part of the North-East French Massive, is registered as a Regional Park since 1975. To stimulate, manage and enhance this rural area, a management organization was formed: the SYCOPARC. Within this organization the Territorial Observatory has the goal to form a precise as well as a global knowledge about the Park. To do so, the work relays on a thorough desktop GIS solution and recently on the ArcGIS Server solution that takes over ArcIMS. These software servers can allow the use and sharing of geographic information. The Territorial Observatory develops many of the emblematic data that are necessary from a strategic point of view to make public. In this respect, interactive mapping and an interface allowing the download of data are being put on the internet, this precise methodology being explained in the present paper. The objective is to select, prepare and publish data for the general public so that it will convey a clear geographic information as well as consistency to the strategies of SYCOPARC. Thus, the former interactive mapping application is updated. The dissemination of geographic information takes place in two stages: the valorizing of data, conducted as part of an interactive mapping application and the sharing of it, under the form of an interface for GIS data download. The operational implementation of this project involves three successive phases in chronological order:

- The creation of the application on desktop software (ArcGIS Desktop).
- The publication of the draft created through a map server (ArcGIS Server)
- The use of interactive mapping and the direct download of data (website of the Nature Park).

Keywords: *Regional Nature Park, The Northern Vosges, geographic data, Geographic Information Systems (GIS), ArcGIS Server, Internet, Interactive mapping.*

1. INTRODUCTION

The dissemination of geographic information is a central task for the NorthernVosges Regional Nature Park, for its management organization, the SYCOPARC, and especially for its territorial Observatory. The sharing and providing of location-based information is based on information and communication technology which exude in modern tools

[1] *Université de Strasbourg, Faculté de Géographie et d'Aménagement, Home adress : 9, rue du Maréchal Leclerc 57930 Fénétrange, Tél : +33(0)688579202, E-mail : kevin.dabert@etu.unistra.fr*
[2] *Université de Strasbourg, Laboratoire Image, Ville, Environnement (CNRS/UdS), Adress : Faculté de Géographie et d'Aménagement, 3, Rue de l'Argonne 67000 Strasbourg-France, Tél : +33(0)368850968, Fax : +33(0)368850950, E-mail: aziz.serradj@live-cnrs.unistra.fr, Page Perso. : http://imaville.u-strasbg.fr/perso/asrec.html*
[3] *In charge of the Observatory Regional nature Park of Northern Vosges, Adress : Maison du Parc, Le Château, BP 24, 67290 La Petite-Pierre, Tél : +33(0)388014966, Fax : +33(0)388014960, E-mail : g.hirlemann@parc-vosges-nord.fr , Web : www.parc-vosges-nord.fr*

providing an opening to the exterior and highlighting the available spatial data using more and more elaborate techniques. Actually, as the present paper underlines, the Observatory disseminates its geographic data as an interactive mapping application so as to valorize and to share it via a download interface for GIS data.

The dissemination of geographic information is a strategic objective. In what regards the project, SYCOPARC must be innovative. Even if the diffusion of geographic information on the internet is booming and online Geomatics finds a favorable environment of technical progress, the structures are still struggling to "liberate" their geographic information on a network where they can't really manage the flow.

Once we will have presented the territory of the Northern Vosges Regional Nature Park, we will analyze the general context of the broadcast. Based on these factors, the operational implementation of our tools will be presented, for starter with the selection and the preparation of the data to put online, then with the publication of geographic information. Finally, we will be able to observe the main characteristics of the tools that we have created.

2. THE STUDY CONTEXT

The general context for this research and implementation of the disseminated geographic information provided by the park Observatory is directly related to the actions of the Northern Vosges Regional Nature Park (PnrVN).

2.1. What is a Regional Park?

A Regional Nature Park is a rural inhabited area, nationally recognized for its strong heritage and landscape value. This area is also deemed fragile as threatened by rural decay or urban pressure and / or excessive tourism. The initiative to form a regional natural park is to be taken by the **Regional Council**, in collaboration with: the General Councils, the EPCI (public institutions of intercommoned cooperation) with the communities of the commons, cities or urban areas, but also with the municipalities and various partners (public services and institutions of the state, socio-professional organizations, associations, etc.). This collaboration leads to a shared project made formal through a contract: the charter of the Park. It is on the basis of the latter that the territory will be ranked as Regional Nature Park, by the order of the Prime Minister, for a period of 10 years that can be renewed.

2.2. Presentation of the Northern Vosges Regional Nature Park

The Northern Vosges Regional Nature Park (PnrVN) with its headquarters in La Petite-Pierre (67), was ranked for the first time in 1975. This rural area is managed by a management organization, a mixed union named SYCOPARC (Cooperative Unions for the Park), which aims to protect, enhance and animate its territory according to the strategies listed in its charter.

Presented in a few figures, the Northern Vosges Regional Nature Park is a territory of 130 500 hectares of which 62% is occupied by forest, making it a medium mountain forest-dominated area, 33% are occupied by crops and about 5% is occupied by urban areas. With 113 municipalities for 85 049 inhabitants in 2006, the population density is of 66 inhabitants per km ².

This rural area with a natural, cultural and human heritage justifying its classification is located in the North-East of France, straddling the two border regions Lorraine and Alsace and on two departments: the Moselle and Bas- Rhine (Lower Rhine).

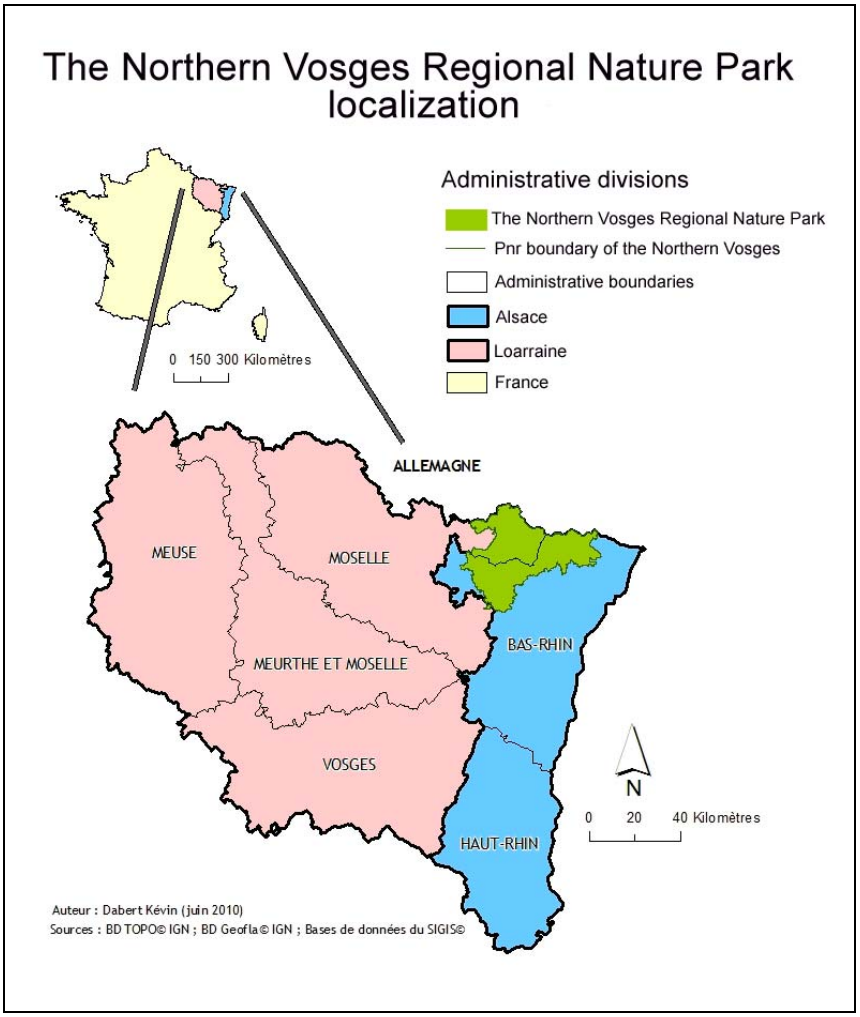

Fig. 1 The Northern Vosges Regional Nature Park localization

2.3. Presentation of the Territorial Observatory

Within the SYCOPARC, there is a transversal task: the Territorial Observatory, central cell for the realization of the union cooperation's actions. The work of the Observatory can be summarized in three main directions:

• *Consistency*: cohesion is a necessary feature of knowledge of the Observatory, be it at a territorial level or at the level of the topics it covers.

• *Knowledge*: it is by a thorough knowledge of their territory that the Observatory meets its role and becomes a tool in decision making.

• *Evaluation*: based on an accurate and coherent knowledge, the Observatory is best positioned to assess and anticipate the consequences of the taken actions.

These objectives are implemented in three main areas:

•*The administration and management of databases and partnerships*: the creation, acquisition, updating of these data, but also the insertion of Metadata information and their cataloging. This is made possible with the help of GIS software from ESRI.

•*The use and processing of the data*: the use of these data for mapping, geographic studies or reports and statistics.

•*Training for the use of the tools and assistance*: the training of project officers, partners or others, to use in a right manner and have a good understanding of SYCOPARC data.

The main operational tasks of the team are:

• **The renewal of the Charter.**

The Northern Vosges Regional Nature Park is close to the end of the period of its territorial project and a new contract should succeed to the present one. In this context, the Observatory is a key player and has achieved a multi-thematic territorial diagnosis.

• **The creation of a database regarding the "orchards."**

The location and registering of GIS layers allows us to understand the spatial and temporal evolution of the tall standard orchards by using the aerial photos from 1999 for the entire perimeter, those from 2004 and 2009 (Moselle) and 2007 (Lower Rhine).

• **An "Urba" database**

To better understand the dynamic aspect of the urban extension of the commons existing in the Park, GIS layers are built starting from the 1890, 1951, 1975, 2002 and 2004 ortophotographs.

2.4. General framework for the dissemination of geographic information

In order to guide well the project for geographic data dissemination, it is necessary to specify the global context. This stage allowed us to identify interactive mapping and data download as tools that constitute an answer to our problem.

2.4.1. Presentation of the Interactive Mapping

Interactive Internet Mapping, also known by its English term, "web mapping", is a mapping type that made its apparition in the early 1990 under the impetus progress registered in the ICT field (Information Technology and Communication).

It is a tool for providing maps and spatial data over a network (internet, intranet) and which can be viewed via a browser. Interactive mapping is therefore at the cross point of three disciplines of geography, computer science and Web development.

The geographic data is changing and it is being used in applications where until recently it was never heard of. This revolution is based on the possibility of making the data digital and on information technology and communications which, along with the internet, have contributed to their opening-up. The general public has therefore access to geographic information and digital maps become a medium of synthetically and attractive communication, very efficient as well, allowing spatial analysis which can influence the decision making process.

Located at the convergence of three major disciplines, interactive mapping has made the geographic information democratic. One of the main concepts identified is of course, the one of interactivity

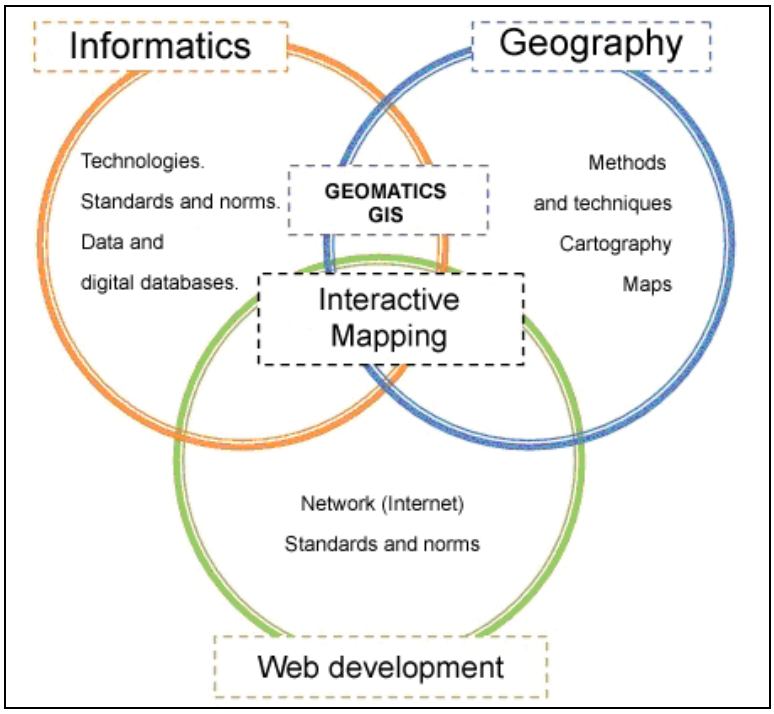

Fig. 2 Interactive mapping at the cross point of three fields

2.4.2. The principle of interactivity

The notion of interactivity allows characterizing the features offered to the user in order to interact with the map, a fluid, fast, practical and intuitive interaction. The data is selectable and allows the user to act within the map and by zooming, moving, selecting and querying, the interactivity is growing.

On the internet, there are maps displaying different levels of interactivity, ranging from the static map (simple display of an image on an HTML page *) to the dynamic map. The highest interactivity available level is offered by Web GIS, displaying all the capabilities of a desktop GIS. An intensive interactivity allows an unprecedented exploration and analysis level of maps, thus improving the understanding of information transmitted to the reader.

Interactive map	- ← Degree of interactivity → +		
	No interactivity	*With the map*	*With the database*
Static	Map can be seen (it is a fix map)		
Dynamic	Map can be seen (as an animation)	Map selections: -Successive images - layer selection	Map to be created

Fig. 3 Interactive online maps classification (*Cauvin, Escobar, Serradj, 2008*)

2.4.3. The principle sharing of geographic data

Many regulations encourage the sharing of data, one of them being the European Directive 2007/2/EC, called the **Inspire directive** of 14 March 2007, establishing an infrastructure for spatial information in the European Community. It requires the public authorities to make data accessible to the general public by publishing them, under certain conditions, by the means of **information and communication technolog**y, but it also establishes the sharing of data among authorities. In this respect, it defines a regulatory framework for the establishment of facilities for producing, sharing and reusing digital and statistical geo-referenced geographic data.

The Inspire directive is part of a context registering significant growth in demand for geographic information thanks to technical and technological progress in this field. This demand runs up against the badly organized supply of information as well as against financial obstacles, legal ones or against standard or interoperability problems. The harmonizing and improving of the readability of the data is necessary as well. In short, the central concepts of this directive are summed up in seven principles:

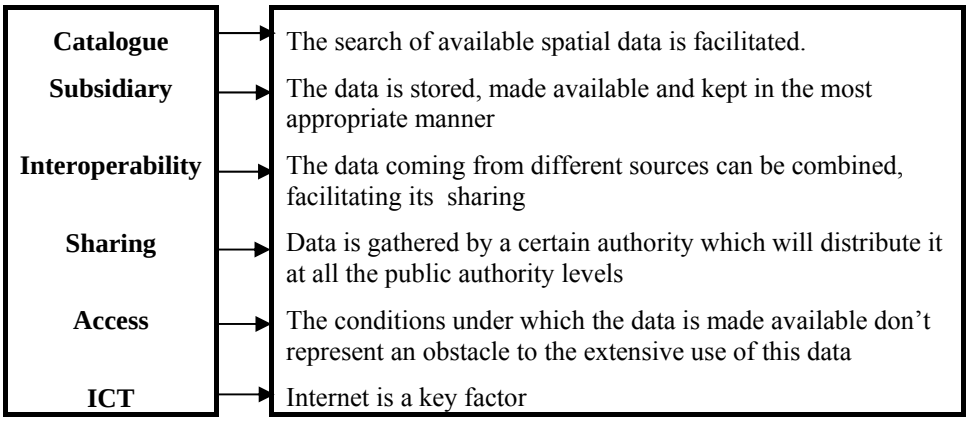

Fig. 4 The main principles of the Inspire directive

2.4.3. The principle interoperability

Interoperability is the ability of a system or product to work with other systems or products.In other words, it is the ability to cooperate, here this capacity regards spatial data and their supporting platforms, as well as the various tools for sharing information, the most important being Informatics and Internet.

The analogy between cartography and telecommunications is far from perfect, as for these two technologies to be made compatible, the regulation and standardization of protocols is necessary. We can therefore quote the W3C (World Wide Web Consortium) in the field of computing and Web, which aims to establish usage standards such as HTML, HTTP exchange protocol or the URL adresses. The action of the OGC (Open Geospatial Consortium) must be noted as well as it concerns the geographic information directly by establishing standards destined to facilitate data exchange in formats such as KML and the WMS or WFS data exchange protocols. The norms and standards are therefore increasingly in popularity and are adopted more and more.

3. THE IMPLEMENTATION TECNIQUE

Initially, the data to be published will be selected and prepared. Afterwards it will be published with the help of ESRI ArcGIS Server software.

3.1. The selection of data that will be made public

The data to be published comes from the SYCOPARC and not only as here its is necessary yo identify that data that it would be interesting to publish.

3.1.1. The data of SYCOPARC

The Territorial Observatory is the owner and creator of geographic data and statistics as we have seen already. Nevertheless it is necessary to choose only the data which valorizes the emblematic actions of the SYCOPARC.

An initial reading of the Park charter, together with the latest activity reports, led to a more accurate understanding of the Park strategies regarding its territory. Thus, a first list of data has been developed and organized according to different thematic entries. Then, this first validated database was presented internally.

3.1.2. Background maps

The availability of data on the internet site, data created by the Park is not enough in order to make functional the interactive mapping application. Actually, the application relies on a series of standards that allow the valorizing of our own data.

The study of the possible benefits that meet these needs has helped to identify and select two options: The use of a web service or the publishing of our own IGN data.

Web services

With the advent of the Internet and interconnection of network computers, it becomes possible to remotely run applications. Thus therefore there is not one but several map servers in a network, which run the application. A part of the data is hosted internally another part is hosted externally and is connected to the application via URL connections, meaning the local web services.

These data do not require maintenance or updating as this is done at the external level, by the provider itself. Moreover, the increase in the number of servers for an application, improves the performance of the latter. It is then possible to add their own business data, thus creating high quality applications. These applications are also called mashups, this concept referring to an application or a map that combines geographical data coming from different sources.

ESRI is a web services provider, with ArcGIS Online, which is the central resource grouping storage, retrieval and exchange of maps, layers and services. This service allows you to share different contents with other users. This platform offers for free, much data for licensed customers for internal use as well as non-commercial external use.

IGN data dissemination:

A complementary solution to web services is to disseminate the databases available at IGN SYCOPARC. For this it is necessary to inform yourselves about the rights you have over this data as we are not the owners of it. Actually, it is necessary to have rights for electronic representation.

A first element to take into consideration is the location of the Northern Vosges Regional Nature Park. It is located on two departments among which we have to distinguish the Alsatian part which is a member in the CIGAL (Cooperation for Geographic Information in Alsace) partnership, offering it certain advantages regarding the access to IGN data. While for the part in Moselle, the structure, as Nature Park, is under the MEDAD / MAP / IGN protocol signed on July 24th, 2007.

Regarding the needed data, it appears that some IGN repositories are provided with electronic representational rights within the frame of the CIGAL partnership, in the case of the Alsatian territory. Among the data made available by the IGN on the Lower Rhine, which might interest us, there are the following:

- *BD ORTHO* (1997/1998, 2002, 2007), orthophotos components of the IGN.
- *BD TOPO Pays* from 2006, vector data representing the physical characteristics of the terrain, land use, buildings, transport network, etc.
- *Scan 25 from 2005* is a raster image corresponding to the 1:25000 IGN paper maps.

For the part in Moselle, we refer to the protocol signed between the MESD, MAP and IGN. It defines a general framework for the acquisition, usage and updates of IGN repositories for the yearss 2007 to 2010.The integrated organizations, following their accession, have extended licenses including the rights of representation on referential electronic data:

- *BD ORTHO* (arial photo),
- *Topographic Scan 25* (raster image raster of the 1 : 25 000 map of IGN),
- *BD CARTO* (only within the communal boundaries),
- *Scan 100* (raster image of the 1:100 000 map of the IGN).

It is also possible to acquire additional data by using this protocol, while benefiting from advantageous prices:

- *BD TOPO* geometric description of topographic features and administrative boundaries, as well as the location of thematic information.
- *BD PARCELLAIRE,* for the built parameters and land parcels.

We see therefore that the databases available within the SIGIS © that concern CIGAL or the MEDAD / MAP / IGN protocol correspond to:

- **BD ORTHO®** : 2009 version for the Moselle (57) via the protocol and the 2007 version for the Lower-Rhine (67) acquired through CIGAL.
- **Scan 25®** acquired in 2008 for the Moselle via the protocol and available through the CIGAL for the Lower Rhine.
- **Scan 100®** acquired in 2008 via the protocol for the two departments
- **BD TOPO Pays®**: version 2006 acquired by the CIGAL for the Alsatian part **the BD TOPO** 2008 version, through the use of the protocol, for the rest of the territory.

In conclusion, it appears that we can use ArcGIS Online for the supply of many web services.Plus, thanks to the participation of Pnr Northern Vosges to the MEDAD / MAP / IGN protocol and to the CIGAL partnership, we have access to electronic representation licenses on many IGN data. All these quality data will serve as a repository for our interactive mapping on our website.

3.2. Data preparation

After having selected the data to be put online on our interactive map, it is necessary to organize it and prepare it so that it conveys clear information and that it is compatible with a quality representation on the internet.

3.2.1 Data organization

The data we are going to provide and make use of in our interactive mapping is the one selected in the previous stage of the study. Be it data produced by SYCOPARC or just the IGN repositories posted online, it is necessary to structure and prioritize them thematically according to a nomenclature and different key inputs where our data fits in:

Hydrography
Park Limits
Administrative Boundaries
The transboundary biosphere reserve
Tall standard orchards
Territorial Planning
Natural Heritage
Land use
Landscape
Geology
Park Map (2012 - 2025)
Culture and Heritage
Tourism
Ecomobility
Itineraries
Education
Communication
Aerial Photographs
IGN Maps

These geographic data are characterized by different indicators:

Themes: higher level held within the hierarchy (described above).
Data: the information layer that is broadcast.
Format of data: raster or vector format.
Strategic priority: (1: priority: 2: to consider, 3: low priority).
Availability: (1: available; 2: being acquired or updated; 3: to create or to update (in perspective).
Target audience: general public / elected officials / partners
Display: the scales of maximum and minimum display.
Download: data that can be or not downloaded by the user.
Copyrights: rights and constraints, mentions to be applied
Costs: costs of making available data on the Internet.
The attribute information: attribute information disseminated to the public.
Observations: additional information.

3.2.2. Data preparation

(First step: creation)

In the technical implementation of interactive cartography, data preparation is the first of three stages:

Create
Publish
Use

The organization of data according to thematic key entries offers more visibility serving the purpose and the strategy of our publication and is followed in a logical manner by a more operational stage of preparation of this data. Among the data to be made available, we must distinguish the available data in raster format and those available in vector format as the preparation of one and the other is different.

The preparation of vector data

The technical implementation of interactive mapping with the ESRI solution is organized as follows: ArcGIS Desktop (desktop solution including ArcMap, ArcCatalog, ArcToolbox, etc.) is used to produce maps that will be subsequently made available online, via ArcGIS Server.

It is within an ArcMap project (main application of ArcGIS allowing the viewing and working on geographic data, and thus creating maps) where the data that is going to be prepared is imported. There are several elements upon which we have to work on:

- The attribute information.

All the processing and interactions the user will have with our interactive mapping, is based on the information contained in the attribute table. It is important to act on this data so that it broadcasts a clear and useful information. It from the processing carried out on an ArcMap project that the necessary thematic data will be extracted.

- The representation

Once the data is ready and contains in its attribute table information that may be useful to the user, we must act upon the symbology for the representation of the same information. This step is essential because these same symbols will be used in our interactive map.

- The display threshold.

The display threshold or thresholds are, by definition, the minimum and maximum ranges between which data can be represented. Some vector data are useless when viewed on a scale that is too large or too small. The interest here is to aesthetically improve and to make useful the interactive map.

Preparation of raster data

Raster files are the repositories on the basis of which our vector data will be calculated. Contrary to vectors which needed preparation in order to transmit any clear information, raster preparation is primarily dedicated to enhancing the performance of our interactive mapping because a raster can weigh a lot, hence diminishing the performance of the application.

- The implementation in cache

The availability of our raster data via an Internet application can be costly and limit the performance of our tool. To avoid slowing down the display, there is a technique of storing our data in image format, in cache. Useful from the moment of opening of the application or useful so as to fulfill the request made by the user, the cache bypasses the map server and stores recorded data which is also ready to be displayed directly on the web server. The hidden data is already prepared, that is to say they are already stored at different scale levels.

When the user zooms in on the map, its application will result in a relay between two data images stored on different scales, without the map server being queried. The map server is therefore available for other queries, its performance being optimized.

Before discussing the storing as a cache it is useful to define our scale levels. For this, the maximum and minimum scale must be set, and from what we've observed, this threshold is represented by 1: 280 000, a scale that allows us to have a clear vision of the entire park territory, and the maximal zoom has been established at 1:1500, as above this value, the data doesn't transmit the user more accurate information. In between these maximal and minimal thresholds, we've made the choice to use the thresholds existing in Google Earth so that our data is compatible with this platform

- The display threshold

The display thresholds are defined based on the visualization scales defined above. Actually all our data will not be available for all these scales, as some become obsolete when viewing in too general or too specific details. This work is necessary to be done so as to ensure the performance of our tool and the proper use of our data, but also to limit the importance of storage caches.

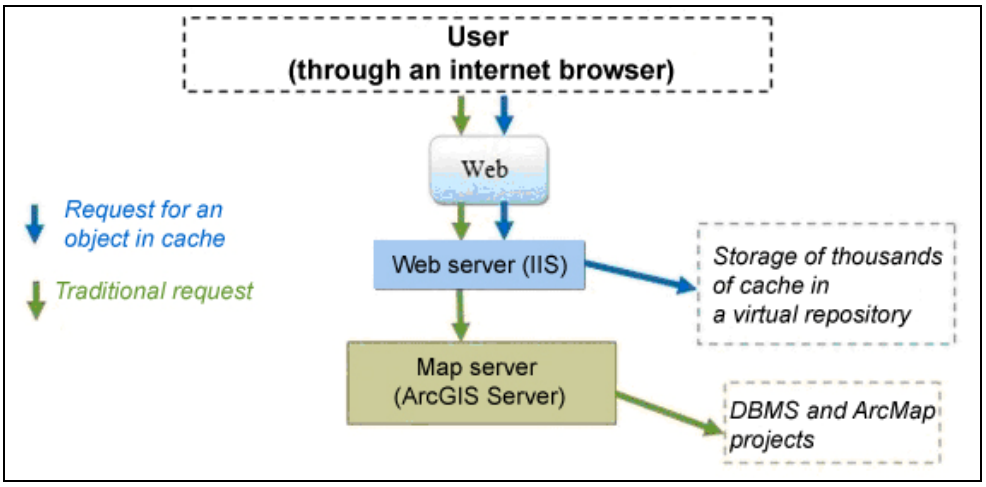

Fig. 5 Request of a cache file

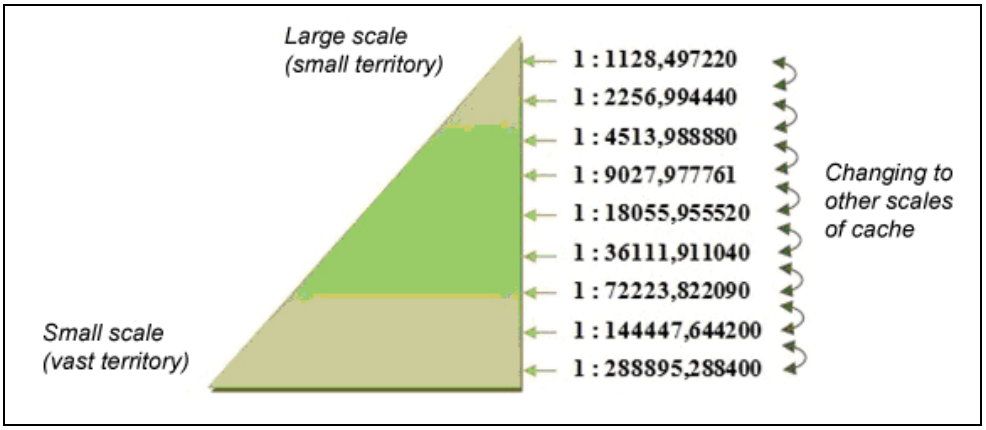

Fig. 6 Pyramidal principle of thresholds when zooming in a cache file

3.3. The instauration of interactive mapping

The data is now ready to be published and it is time to do so through ArcGIS Server.

3.3.1. Presenting the ArcGIS Server solution

At SYCOPARC, the solution ArcGIS Server takes over the ArcIMS one, the latter having been used to deploy an interactive map on the website of the Park in 2001, totally innovative method at the time, this solution nevertheless requires an update, hence the choice of ArcGIS Server. The ArcGIS Server proposed by ESRI is used to publish services regarding mapping and geographic data. This solution, known as the most powerful, has advanced GIS features incorporated, worthy of office software.

Our solution is licensed under ArcGIS Server 9.3.1 Standard Edition and Workgroup Edition for Windows. Regarding the development of our application, we have two options within the development* environments and frameworks* (function libraries). NET * or Java*. Our choice was the solution offered by Microsoft.

The features offered by ArcGIS Server are several:

- Publish interactive mapping for different types of audience.
- Facilitate the exchange of geographic information.
- Manage spatial data at a central level.
- Simplifying access to resources.

3.3.2. Architecture implementation

The developed architecture is a client / server type, that is to say that there is a series of client computers connected to a server communicating to the outside through a web server. This can be 2-tier or 3-tier architecture. According to the case, there are two or three levels:

- The client
- The server for the application
- the server for the database.

2 tires architecture

3 tiers architecture

The architecture is divided into two parts, the client side (user) and the server side for the center:

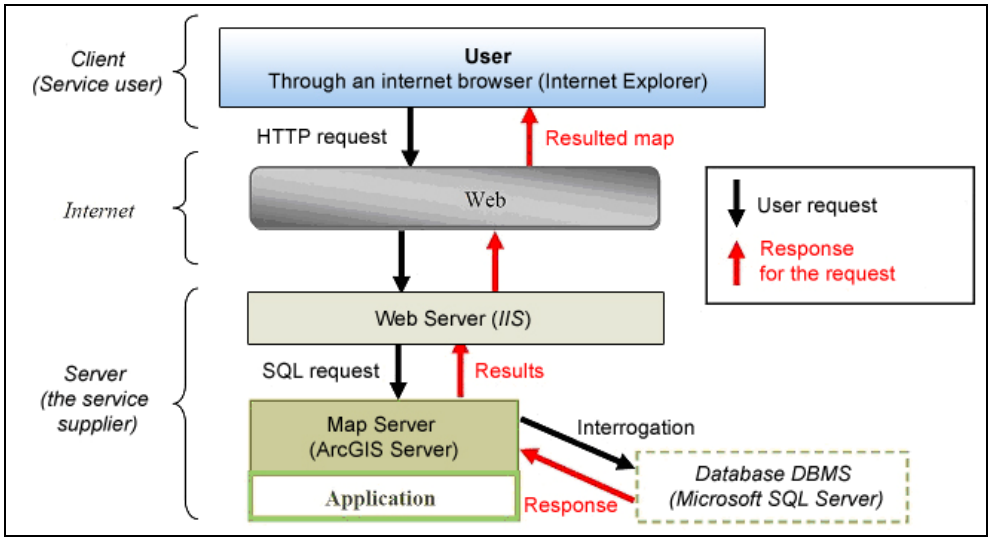

Fig. 7 Client-server architecture

- **The client**

All web browsers can access our maps via a standard web browser.

- **The server**

The ArcGIS Server acts as the map server connected to ArcSDE, a RDBMS* of the Microsoft SQL Server type that is implemented in the ESRI solution.

- **The web**

The application is available on the network by installing a web server.

4. THE PUBLICATION AND ANALYSIS OF RESULTS

4.1. The publication

(The second stage: the publication)

In the technical implementation of an interactive map, the service publication is the second of three stages*:*

Create.

Publish.

Use.

At first, you must create one or more ArcMap projects that will be disseminated and will provide interactivity to the user. In our case, all the selected and available data (upon which we have user rights and that are up to date) are grouped in 12 ArcMap thematic projects resulted from the organizing of the data, as discussed in the previous sections of the paper. Those themes that are not available to be disseminated, undergo the process of updateing.

These several projects are published as map services:

Hydrography
Park boundaries
Administrative Boundaries
The transboundary biosphere reserve
Tall standard Orchards
Territorial Planning
Land cover
Natural Heritage
Landscape
Geology
IGN maps (raster data in cache)
Aerial photographs (raster data in cache)

Data from the territorial Observatory of the Northern Vosges Regional Nature Park is published to be shared via a download interface and to be used through an interactive mapping application. This use is permitted by the release of reference maps. In addition, the use is based on web services offered for free by ArcGIS Online.

Among the data available, we can retain some such as:

« ESRI_StreetMap_World_2D »
« ESRI_Imagery_World_2D »
« ESRI_ShadedRelief_World_2D »

These three databases can serve as maps for the entire world.

« ESRI_Geocode_EU »

Geocoding service at the europeean level.

Then, the publication of our data can be done in different ways:

- Publish via ArcCatalog.
- Publish via the ArcGIS Server Manager.
- Publish via ArcMap.

In ArcMap, you can publish the project in .MSD, not in .MXD to improve performance. This format is based on lighter graphics engine.

ArcGIS Server offers us the opportunity to publish our projects as map services to make them available in our application. But it is also possible to publish these services in different formats or "capabilities" compatible with the standards of the OGC: the KML, WMS and WCS for rasters and WFS for vectors.

4.2. Implementing an API

Since when the ArcMap projects are issued as map services, we can use them in an interactive mapping application. Therefore, our choice was to use an API. An API is an Application and Programming Interface, that is to say a library of functions for easier programming. Clearly, it is a set of standard routines, accessible and documented, which are intended to facilitate the programming and application development. The ArcGIS Server solution implements three API:

- JavaScript,
- Flex,
- Silverlight

4.2.1. Choice of API Flex

Our choice is based on API ArcGIS Server for Flex, proposed by Macromedia, allowing us to take advantage of Flash technology in our application. It helps develop an allowed rich Internet application (RIA) among other things, by the use of AJAX and XMLHttpRequest which lie at the basis of progress in the field of web. These innovations enable interactive mapping applications to be more functional, more efficient and faster to display.

4.2.2. Application based on Sample Flex Viewer

The Viewer is a web site model created by ESRI with the API Flex for ArcGIS 9.3. It allows developers to quickly build, in a simplified manner, an interactive mapping application on the Internet. It will have all the features offered by ArcGIS Server without having to deploy them through the code (as for example in web ADF).

However programming skills and sufficient knowledge of the Flex language (ActionScript) are needed. The software required for its implementation are:

- An IDE such as Flash Builder
- API Flex for ArcGIS which is implemented directly in Flex Sample Viewer
- The ArcGIS Server and Desktop software for the initial stages.

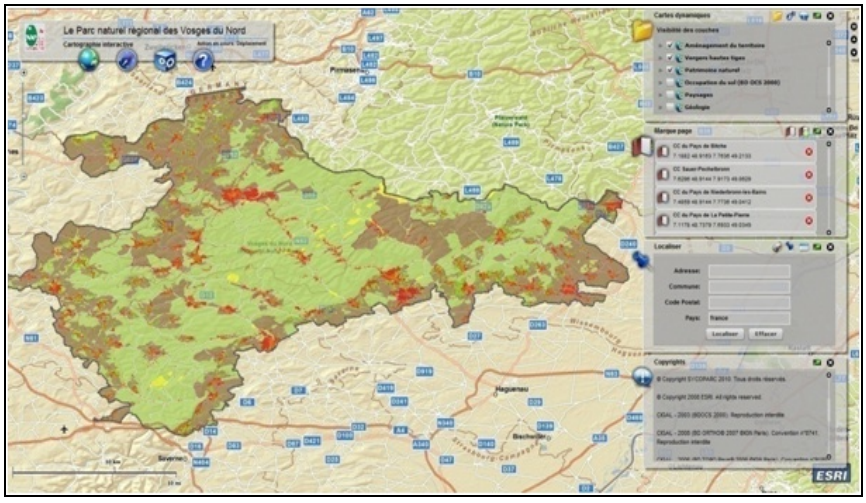

Fig. 8 Interface of the interactive map of the PnrVN

Without going into technical details, the application code was downloaded and edited using the Flash Builder software, so we acted upon it to personalize it and enjoy the features it has already integrated. Then, according to the philosophy of API REST API for ArcGIS Server ("All is a URL"), we can call our map services via their URLs generated upon publication. Then we can add the addresses of the selected ArcGIS Online services. Thus, interactive mapping becomes a *mashup* as it consists of services hosted on different servers.

Beyond the simple visualization of the geographic information in an application with good aesthetics and very advanced performance, we can further improve the functionality of interactive mapping in Flash, thanks to the widgets principles. This contraction of the words "windows" and "gadgets" describes a small tool, a component of the graphical interface from which the user can perform a complex task by simple ergonomics and according to a logic defined in the program code.

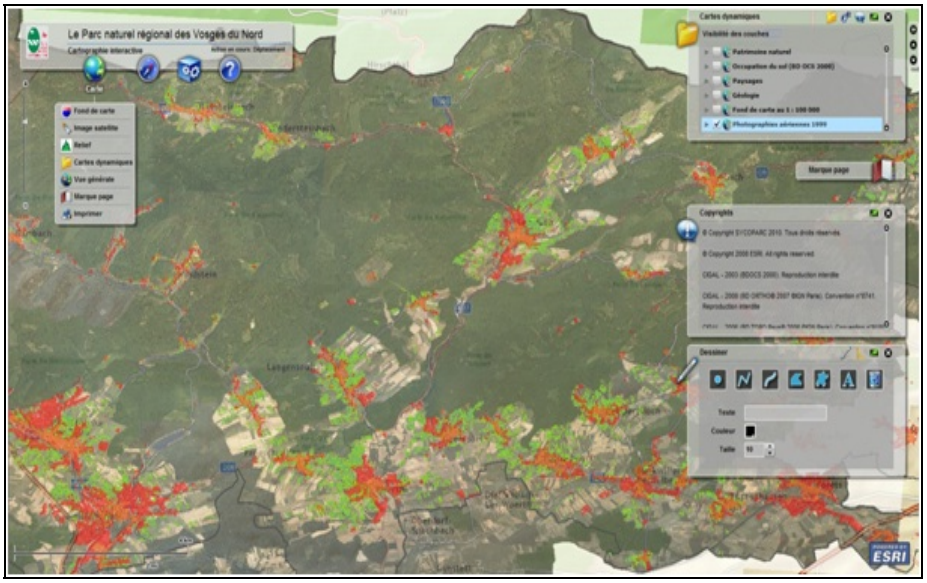

Fig. 9 Interface of the interactive map of PnrVN-2

4.3. The interface for downloading data

Interactivity and all the features of our map (location, identification, zoom in and out, the selection of layers to be displayed, etc.) allow the performing of geographic analysis. The characteristic data that can be the object of an analysis in this case, are the urban sprawl and the tall standard orchards.

Data sharing on the interface of the website of the structure is permitted by the publication of the map services as we have previously seen. Actually, at this stage, we can make a choice between several "capabilities" to select.

Technically, the downloading of data is a service available on an HTML page of the website of the Northern Vosges Regional Nature Park. This data will be available on the access interface of our interactive map where we will find:

- A direct **URL link** to our interactive map application.
- A **table listing the data for downloads** in multiple formats.

	Standard formats of the available data				
	KML	**WMS**	**WCS**	**WFS**	**.shp or .lyr**
The geographic data that can be downloaded	The link: Yes/No Empty : Yes/No	The link: Yes/No Empty : Yes/No	The link: Yes/No Empty : Yes/No	The link: Yes/No Empty : Yes/No	The link: Yes/No Empty : Yes/No

Fig.10 Download data table for the different existing tables

Within this table, the links are those of the URLs that had been generated when publishing the data. The user will have easy access to our data that he can display within his own desktop applications or within the applications from other servers (Google Earth for KML).

4.4. The benefits

(*Level three: Use*)

In the technical implementation of an interactive map, the use of the service is the last stage:

Create.

Publish.

Use.

Interactivity and the totality of functionalities of our map (location, identification, zooming in and out, selection of layers to be displayed, etc.) allows us to perform geographic analysis. The characteristic data that can be analyzed here are the urban sprawl and the tall standard orchards.

4.4.1. Analysis of changes in the urban sprawl

Data on the urban sprawl are available through the interactive map, for 1890, 2002 (Lower Rhine) and 2004 (Moselle). The distribution allows us to study the evolution over centuries. The data are public and thus allows the general public to understand the urban sprawl over the historical period.

The information about urban sprawl, faced with population censuses from those years, allow an exact understanding of the dynamics of the territory. For example, for the Bitche commune, we have a layer of geolocalized information on the extension of the built perimeter in 1890 (in orange) and 2004 (in red), to which the censuses from 1891 and 2006 can be added, hence allowing us to conduct a geographical analysis of the registered evolution.

Urban surface (in ha.)	**Population (in inhabitants)**	**Density (inhabitants/km^2)**	**Density (urban sprawl)**
42 in 1890	2854 in 1891	70	6793
413 in 2004	5607 in 2006	137	1358
+ 883.3% over the considered time period	+ 95.6% over the considered time period	+ 96%over the considered time period	- 81.01%

Fig. 11 Evolution of the urban area, population and density in Bitche between 1890 and 2004

On the basis of the provided data, it is possible to realize the strong increase of the built surface of the commune. Compared to this evolution, the number of inhabitants and the population density has only slightly increased. Moreover, if the density is reported to the urban sprawl, a diminution is observed. It is possible to conclude from this data that the built perimeter per inhabitant is characteristic for the evolution of the urban sprawl, as a resident occupies more space for lodging in the early 2000, if compared to the XIXth century.

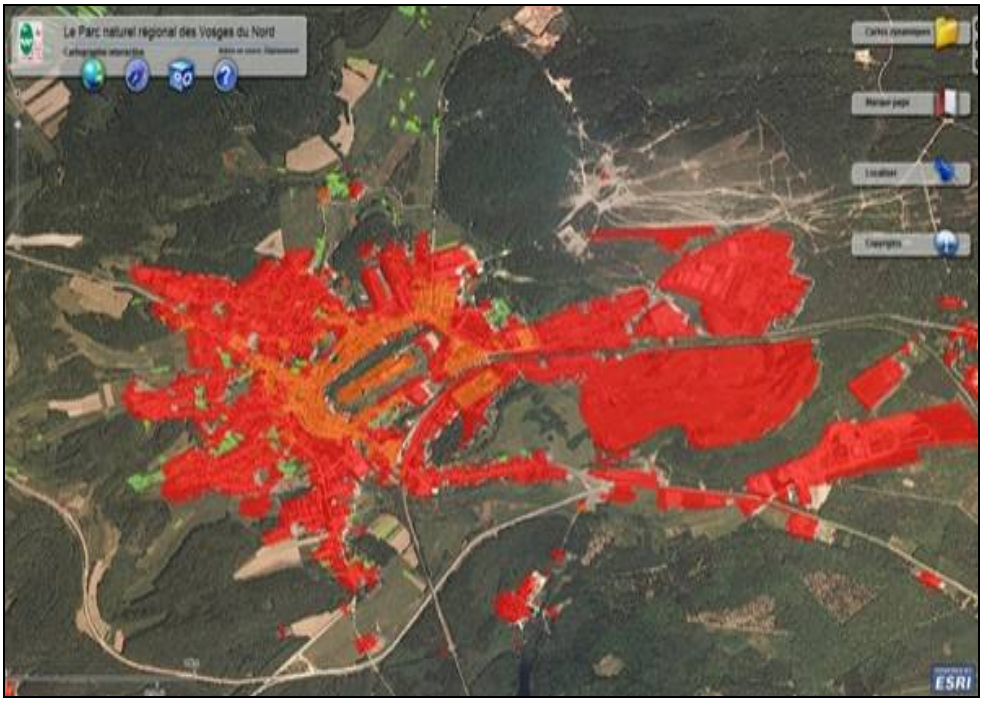

Fig. 12 The urban sprawl of Bitche visualized over the interactive map

This conclusion represents a major shift on the territory in the Northern Vosges, the population growing more slowly compared to the urban and agricultural areas. The tall standard orchards, a key point of the SYCOPARC action, are surrounding the villages and hence are directly affected by the urban extension projects.

4.4.2. Analysis of changes in tall standard orchards

The evolution of urban sprawl is an indicator to be considered within the objective of SYCOPARC which protects the tall standards orchards. Actually, the GIS inventory and spatializing layers of the tall standard orchards, are available for several years: 1999 for the entire Park, 2004 to 2007 for the Moselle and Lower Rhine

The user can analyze the development of tall standard orchards and raise awareness of the causes for their disappearance (urban expansion, consolidation, 1999 storm, etc.). By posting these layers and with the help of interactive mapping, we can see some obvious changes. Thus, a geographic analysis is just a click away.

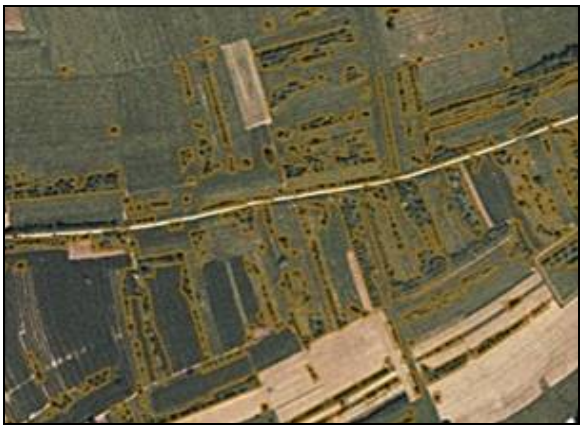

Fig. 13 Tall standard orchards in 1999 at Waldhambach (67)

Fig. 14 Tall standard orchards in 2007 at Waldhambach (67)

CONCLUSION

The dissemination of the geographic information from the Observatory, taking the form of interactive mapping, allows the use of data and its downloading so as to be shared. Making available the geographic information data of the Observatory on the internet site of the Northern Vosges Regional Nature Park, sought above all, to develop an interactive mapping solution using the information and communication technology, so as to make it accessible to the entire world. The revolution in the informational and communication technology, finds, together with the geographical information and the internet, tools that are democratizing, as for example online mapping, GPS systems or the virtual globe such as Google Earth.

In this digital revolution of the geographic information; the INSPIRE Directive and OGC play the engine roles. The sharing and use, the data exchange and provision of maps, interactive or not, with ever more advanced features, will find along with the web, a set of techniques and technologies for the future.

By setting up an interactive mapping application, the Northern Vosges Regional Nature Park was a pioneer back in 2001 and almost ten years later, it remains innovative because it is among the first public structures to disseminate such an important number of high quality data.

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