



the Nature-GIS newsletter

Funded by the
EU Commission
IST project
2001-34641



Nature-GIS:

a European thematic network for Protected
Areas/Preservation and Geographical Information

www.gisig.it/nature-gis

no. 3, April 2003

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WELCOME

This is the third newsletter of the Nature-GIS project, having as object to keep you informed about the progress made in the last months by Nature-GIS network.

This number is dedicated to three main subjects:

- ✓ the Nature-GIS vision,
- ✓ the link between our project and INSPIRE and
- ✓ the technological context of the Nature-GIS web portal.

Suggestions and comments are warmly accepted at nature-gis@gisig.it.

The Nature-GIS partnership



I. Nature-GIS vision statement: position of Nature-GIS within the European environmental networking context

1. Introduction

Recent global advances in moving from paper to digital data has created hitherto undreamed of opportunities to revolutionise access to data, communication of information and for informed decision-making at all levels of society. This move from back room to open door access to information presents new challenges for those acquiring, handling, curating, and providing access to electronic data and information.

Governments collect massive amounts of information related to the environment, particularly at regional and local level. However, the data are often of poor quality, inconsistent standards, stored in non-interoperable information systems and not accessible to the public at local, regional, national and international level. These obstacles prevent from dealing efficiently with the increasingly complex and interconnected issues (increasing number of policies having a spatial impact) that affect the management of protected areas and the nature conservation.

2. Nature-GIS objectives and outcome

Nature-GIS is a network bringing together the different stakeholders in protected areas: users and experts in IT and in nature conservation. The objectives of the network are:

- To offer a contribution to improve access to harmonised information relevant for the implementation of the EU Nature protection and biodiversity policy area.
- To offer as well a contribution to raise awareness regarding the use of GI-GIS in the field of nature protection and conservation. The proposal should be seen in the larger frame of its contribution to the different European documents and conventions that require research, identification and exchange of information to ease and promote conservation of biodiversity.
- To contribute, develop and broaden the dialogue among all levels of responsibility, from the EU to the local level (according to the 6th Environmental Action Plan), i.e. support public access to data and information, in the EU and in the new Accession countries. Operationally, Nature-GIS could become a focal point to identify specific GI-GIS requirements for "Nature Conservation & Biodiversity" in the European Policies.

The network is developed in the following activities. In the first phase there is the assessment of :

- user needs, to characterise the stakeholders in the field, and to make a survey of the scenarios for use of GI in this domain
- data requirements, to individuate and specify the common kernel of GI content to describe protected areas
- functional requirements, to identify the functional requirements for the management of Geo-Information and to define the framework for spatial databases for protected areas.

The anticipated results of the project are:

- Guidelines to improve information sharing in protected areas
- Demonstration of how web access to information is applicable in the field
- European awareness for a supra-national approach in GI management in the field and a push for more concerted / integrated actions.
- The establishment of a truly pan-European "Nature-GIS Group", able to live also after the project end.

3. Nature-GIS Vision

Nature-GIS wants:

- to assess user needs in relation to existing and new policy requirements and to raise awareness on the use and access to geographic information;
- to serve the community of people dealing with environmental protection programmes and management of protected areas

in their daily tasks with applications and information services that conform to the standards proposed by the future INSPIRE legislation, that better streamline the flow of geographic information at local, regional, national and supra-national administrative levels through the definition and adoption of common data models.

As such will establish links, collaborations and synergies with other European organisations that focus on the conservation of protected areas at the regional, national and European level for a more co-ordinated and efficient protection of our natural heritage assets. That is done inside a framework of political developments that set the boundary conditions for the Nature-GIS project:

1. Habitats (92/43/EEC) and Birds (79/409/EEC) Directives: which are concerned with the protection of natural habitats, fauna and flora and the creation of a European network of protected sites. The Habitats Directive, adopted in 1992 is the main Community instrument safeguarding biodiversity and it introduces the obligation to preserve habitats and species of Community interest. Each

Member State is responsible for identifying and designating as Special Areas of Conservation sites which are important for the protection of the species and habitats covered by the Directive. Together, the Special Areas of Conservation designated by the Member States will make up the European network of protected sites, Natura 2000, comprising two types of areas: i) areas designated directly by the Member States under the Birds Directive; ii) areas proposed by the Member States under the Habitats Directive and then subjected to a Community selection procedure.

2. Access to Geographic Information: the access to environmental data is partially regulated by existing European legislation and it is the subject of new Directives currently under development (reporting, ratification of Aarhus convention -see below-, re-use of Public Sector Information)
3. Access to environmental information: the Community Action Programme on the Environment (1987-1992) indicated that improved access to environmental information was a priority for Community action. This objective was later confirmed by the European Parliament in its opinion on the Fourth Action Programme on the Environment.
A new Directive 2003/4/EC has been published on 28th January 2003 on public access to environmental information repealing the Council Directive 90/313/EEC.
The objectives of this Directive are:
 - a) to guarantee the right of access to environmental information held by or for public authorities and to set out the basic terms and conditions of, and practical arrangements for, its exercise; and
 - b) to ensure that, as a matter of course, environmental information is progressively made available and disseminated to the public in order to achieve the widest possible systematic availability and dissemination to the public of environmental information. To this end the use, in particular, of computer telecommunication and/or electronic technology, where available, shall be promoted.
4. Aarhus Convention: The UN Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, held on 25 June 1998 at Aarhus, Denmark, and hence known as the Aarhus Convention, has as main objective to raise public awareness of environmental issues by promoting improved access to information and participation in the decision-making process. The Convention is designed

to help protect the right of every person of present and future generations to live in an environment adequate to his or her health and well-being. To this end, it provides for action in three areas:

- Development of public access to information held by the public authorities;
- Increase of public participation in decision-making which affects the environment;
- Extension of the conditions of access to justice in environmental matters.

The Convention lays down precise rights and duties regarding access to information, including deadlines for providing information and the grounds on which public authorities may refuse access to certain types of information.

5. Sixth Environmental Action Plan: The Sixth Environment Action Programme of the European Community 2001-2010, which sets out the major priorities and objectives for environment policy over the next five to ten years, provides a further justification for this approach. The last measures concern for example "Nature and biodiversity" in which a specific action is foreseen relevant to spatial data infrastructures: "The creation of programmes for gathering information on nature conservation and biodiversity".
6. Infrastructure for SPatial InfoRmation in Europe (INSPIRE): see next article.

4. Nature-GIS and the EU environmental networking context

Nature-GIS is connected with environmental thematics, as nature protection and biodiversity, a frame where several other networks are present and one of the aims of Nature-GIS is to identify the complementarily with these networks and to define a proper policy of collaboration. With this aims the following networks have been contacted:

- Alterra: the main Dutch centre of expertise on rural areas [<http://www.alterra.dlo.nl/english/>]
- BioPlatform (European Platform for Biodiversity): to improve the effectiveness and relevance of European biodiversity research, to contribute to European Research Area for biodiversity and to promote the dissemination of current best practices and information regarding the scientific understanding of biodiversity conservation [<http://www.bioplatform.info/>]
- Centre for Mediterranean Co-operation: it plays an active role in various programmes and international organisations, such as the

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- Barcelona Convention, and is in contact with donors and financial institutions as well as national and regional entities. In doing so, it can contribute to foster co-operation between those institutions which have responsibilities for the management of protected areas throughout the Mediterranean region [<http://www.bioplatform.info/>]
- COE (Council of Europe): intergovernmental organisation which aims to protect human rights, pluralist democracy and the rule of law; to promote awareness and encourage the development of Europe's cultural identity and diversity; to seek solutions to problems facing European society; to help consolidate democratic stability in Europe by backing political, legislative and constitutional reform [<http://www.coe.int/portalT.asp>]
 - ECNC (European Centre for Nature Conservation): it bridges the gap between science and policy, the conservation of nature and especially of biodiversity in Europe [<http://www.ecnc.nl/doc/network/network>]
 - EFI (European Forest Institute): to promote, conduct and co-operate in research of forestry and forest products at the pan-European level [www.efi.fi]
 - EIONET (European Environment Information and Observation Network): to report on the state of Europe's environment so that the European Union and the Member States have a solid basis for developing legislation [<http://www.eionet.eu.int/>]
 - EMERALD - network of Areas of Special Conservation Interest (Council of Europe - Networks of protected areas): for EU member States Emerald network sites are those of the Natura 2000 network. Emerald network finds its legal basis in the Bern Convention [<http://www.nature.coe.int/english/main/econets/emerald/intro.htm>]
 - ENRIN (Environment and Natural Resources Information Network in Central and Eastern Europe and the NIS): to improve the availability of environmental data and information for decision-makers and the general public [<http://www.grida.no/enrin/index.htm>]
 - EON2000+: to integrate environmental state and socio-economic pressure indicators for protection purposes in support of the conventions on biodiversity and European biodiversity strategy [<http://www.geospace.co.at/EON2000p/> and the National Europe office: <http://www.geospace.co.at/EON2000p/sites.htm>]
 - ESPON (European Spatial Planning Observation Network): to improve the knowledge and understanding on spatial development of an enlarging European Union [<http://www.espon.lu/>]
 - ETC (European Topic Centre on Nature Protection and Biodiversity in Paris - Topic Centre of European Environment Agency): is designated by the European Environment Agency (EEA) to assist in its work of collecting, analysing, evaluating and synthesising information relevant to national and international policies for the environment and sustainable development; to support the implementation of the EU network of sites designated by Member States under the Bird Directive and under the Habitats Directive; it is involved in various working groups, steering committees, for international or EU programmes [<http://nature.eionet.eu.int/>]
 - EUROPARC: is the umbrella organisation of Europe's protected area [<http://www.europarc.org/>]
 - EUROPEAN DIPLOMA (Council of Europe - Networks of protected areas): may be awarded for adequately protected natural or semi-natural areas of exceptional European interest from the point of view of conservation of biological, geological or landscape diversity [http://www.nature.coe.int/french/main/reseau_x/diplome/listdipl.htm]
 - European Network of Biogenetic Reserves (Council of Europe - Networks of protected areas): designed to conserve representative examples of the European natural heritage by developing a rigorous, systematic methodology. These biogenetic reserves are selected on the base of two criteria: they must contain specimens of flora or fauna that are typical, unique, rare or endangered and their protective status must be sufficient to ensure the long-term conservation or management of a site according to the objectives set [<http://www.nature.coe.int/english/cadres/networks.htm>]
 - GREEN SPIDER (the European Environmental Communication Network): it works for continuous exchange of experience between member states in the field of environmental communication and to exchange information and experiences with countries that have an association agreement with the EU. It also acts to promote bilateral contacts and co-operation in tangible European projects [<http://www.ubavie.gv.at/greenspider/>]
 - IBA (Important Bird Area): the programme of BirdLife International is a world-wide project aimed at identifying, monitoring and

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- protecting a network of critical sites for the world's birds
[<http://www.birdlife.net/sites/ibaprogramme.cfm>]
- Landscape Tomorrow: to bring together general principles of landscape functioning and development, identify strategies of sustainable rural development and multipurpose land use and support European landscape diversity and identity [http://www.landscape-tomorrow.net/]
 - MIRABEL (Models for Integrated Review and Assessment of Biodiversity in European Landscapes): an integrating conceptual framework to analyse the consequences of environmental change for biodiversity.
 - NATUROPA (Council of Europe - Networks of protected areas): network of awareness-raising campaigns in order to draw attention to specific topics such as soil, freshwater, wetlands, farming and wildlife, etc [http://www.nature.coe.int/english/cadres/naturropa.htm]
 - PARC-UNEP (Protected Area Resources Centre): to provide for the information needs of the IUCN World Commission on Protected Areas (WCPA) and the wider protected areas community [http://www.unep-wcmc.org/protected_areas/pavl/parc.htm]
 - PEEN (Pan-European Ecological Network (Council of Europe - Networks of protected areas): is mainly based on existing European networks (the EU Natura 2000 network and its extension to States which are not members of the EU: the Bern Convention Emerald Network) to assess and analyse existing initiatives both at international and national levels; to provide a concrete framework to implement the Pan-European Ecological Network; to encourage the development of national ecological networks and their linkage to the Pan-European Ecological Network [http://www.nature.coe.int/english/main/econets/peen/respan.htm]
 - RAMSAR: Convention on Wetlands, (Rasmar, Iran in 1971) an intergovernmental treaty which provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources [http://www.ramsar.org/]
 - REC (Regional Environmental Centre for Central and Eastern Europe): a not-for-profit organisation to assist in solving environmental problems in Central and Eastern Europe through encouraging co-operation among non-governmental organisations, governments and businesses, supporting the free exchange of information and promoting public participation in environmental decision-making [http://www.rec.org/]
 - Rete dei Parchi (Interreg IIIC) : to create a vast net of aggregation among the various European Parks [http://www.retedeiparchi.com/italiano/default.htm]
 - The Alpine Network of Protected Areas: to establish a network of existing national and transfrontier protected areas, of biotopes and other protected elements or those to be protected. They commit themselves to harmonise the objectives and applicable measures in transfrontier protected areas [http://www.alparc.org/800-index.phtml]
 - The Biogeography & Conservation Lab's: research programme is a specific Natural History Museum (NHM) response to the Convention on Biological Diversity [http://www.nhm.ac.uk/science/projects/worldmap/]
 - The European Heathland Network: to enable all persons involved or interested in ecological research, conservation of wildlife, and in policy formulation and implementation in relation to European heathlands to meet, to stimulate discussion, to promote communication, to further the understanding of heathland ecosystems and to disseminate information as widely as possible [http://www.english-nature.org.uk/heathlands/default.htm]
 - WWF-MPAs (Network of Marine Protected Areas) in the north-east Atlantic: its scope is to protect the offshore, pelagic and deep sea marine environment of the OSPAR Maritime Area which reaches from territorial waters (12 nautical miles) to Exclusive Economic Zones (200 nm) and the High Seas beyond. [http://www.ngo.grida.no/wwfneap/Projects/MPA.htm]
 - WWF - PAN Parks: to introduce a marriage between nature conservation and tourism on a European scale. PAN Parks aims to create economic incentives for conservation of nature by changing tourism from a threat into an opportunity by building partnerships with nature conservation organisations, national parks, tourism businesses, local communities, and other interest groups on a local, national and international level [http://shadow.apd.hu/].

II. Nature-GIS and INSPIRE

INSPIRE (INfrastructure for SPatial InfoRmation in Europe) is a recent initiative launched by the European Commission and developed in collaboration with Member States and the accession countries. It aims at making available relevant, harmonised and quality geographic information to support formulation, implementation, monitoring and evaluation of Community policies with a territorial dimension or impact.

INSPIRE will contribute to sustainable development by supporting the integration of the environment in other policies and the integration of social and economic considerations into environmental policies. For this purpose, spatial data common to several sectors and needed for environmental policies will be organised and co-ordinated by involving the sectors concerned.

The objective of INSPIRE is also to provide for a high level of protection of the environment by unlocking the rich potential of spatial information available in the Member States for the support of environmental policy.

The initiative intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an inter-operable way for a variety of uses.

The following principles govern INSPIRE and would be included in the legislation:

- a) that spatial data should be collected once and maintained at the level where this can be done most effectively
- b) that it must be possible to combine seamlessly spatial data from different sources across the EU and share it between many users and applications
- c) that it must be possible for spatial data collected at one level of government to be shared between all the different levels of government
- d) that spatial data needed for good governance should be available on conditions that are not restricting its extensive use
- e) that it should be easy to discover which spatial data is available, to evaluate its fitness for

purpose and to know which conditions apply for its use.

The implementation of the INSPIRE initiative should result in a higher efficiency of the considerable investments made today into the collection of geographical information both at Community and Member State level. It should also reduce and gradually get rid of the duplication of collection of geographical information that now takes place because existing information cannot be reused, accessed or integrated for specific policy needs.

The economic benefits of the creation of this harmonised information base for the added value information industry and its employment should not be underestimated. In return, the availability of advanced information and tools would provide decision-makers with a new range of instruments for policy evaluation, analysis of scenario's, etc.

The availability of a European Spatial Information Infrastructure, combined with the rapidly expanding possibilities of Internet access would become a new means for communicating with the citizen about issues of concern for all policies with a territorial dimension. It would increase the visibility of the impacts of Community policies for the individual citizen and his individual environment.

Better communication would also raise the awareness of the citizen on the importance of Community policies, which would feed back into more political support for new policies built on a common perception of problems.

Both policy-makers at the international, Community, national and local level, the citizens and their organisation and industry will benefit from the INSPIRE initiative, directly as users of the information or indirectly through the availability and use of the information by others.

Nature-GIS has been selected as pilot demonstrator of INSPIRE for Protected Areas. The demonstrators (together with the results of the on going study on impact assessment) could play an important role during the process of co-decision of the European Parliament and Council. They should demonstrate the feasibility and advantages offered by a open, multi-sector, multi-level SDI (Spatial Data Infrastructure).

III. The Nature-GIS technical vision

The main requirements identified for the Nature-GIS Network (some are directly derived from already reported key requirements of the INSPIRE initiative) are:

- Information collected once and maintained at the right level
- Information combined seamlessly from all sources between many users and applications
- Information shared across all level of the providers federation (local to EC)
- Information and condition on how to use it easy to discover
- Ease-of-use in a multi-cultural environment (multi-lingual, semantic, symbology, etc.)
- Insuring quality of services provided to users
- Necessity of building services upon legacy systems
- Providing quick access and responses to users
- Managing security and access rights
- Providing dedicated services for dedicated thematic users.

This vision of the Nature-GIS project corresponds to building a real Nature Spatial Data Infrastructure (SDI) based on INSPIRE recommendations. It consists of a data service network to existing data sources, a metadata framework, the definition of the information to be managed and described by metadata allowing the discovery and access to the services, catalogues of services and generic application.

The main idea behind the Nature-GIS Network prototype is to:

- Create a Thematic Network for the nature community to support management of protected areas using a federation of servers (proposing services) accessible at multi-levels.
- Set up a web application to access this network and facilitate development of many other web applications on the Thematic Network
- Propose guidelines, built from the above requirements
- Put the network and prototype application in place and refine the guidelines based on feedback received during the project

We believe that there is a great opportunity in Europe to demonstrate a real Interoperable Environment Network in support of the Nature Thematic Network. This network will empower users with new possibilities and let them invent their future. Success will be determined by the prototype application adherence to the above requirements, the use of the prototype SDI by the participating

stakeholders as well as the quality and ease-of-use of the guidelines.

For the building of such a Nature-GIS Network the following concepts are of focal importance:

- Interoperability

Interoperability can be defined as the ability for one application, whether server or client, to discover another application's capabilities, to understand them and to dynamically use them from the application side. In the future, it will be possible to bind several online services together in a dynamic "service chain".

Interoperability can be seen as defining a common language for all process to understand each other.

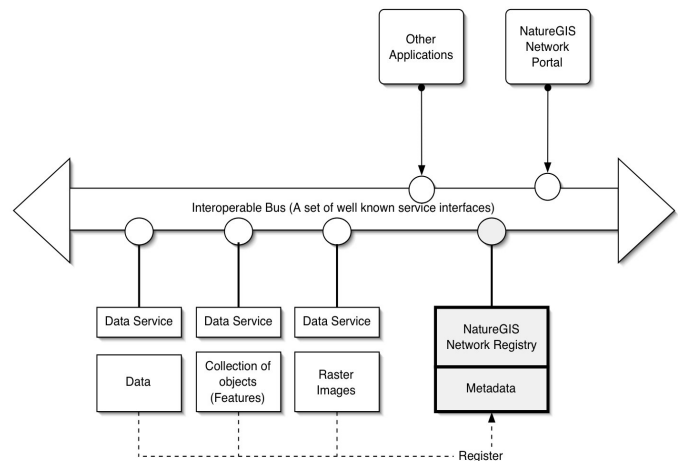


Fig.1 NATURE-GIS Network Functional Interoperability

- Standard based foundation: building on standards provides interoperability. The EC nature community, aligned with INSPIRE, should focus on mainstream standards to ensure that the Nature-GIS Network will target the largest possible audience.

At the network level, the Nature-GIS Network should be based on TCP/IP.

At the Geographic Information level, the International Organisation for Standards (ISO TC211, (<http://www.isotc211.org>) focuses on standardisation in the field of digital geographic information and the OpenGIS Consortium (OGC, <http://www.opengis.org>) focuses on specifying interfaces to access and discover geo-spatial data over the Internet. Some specifications of interest in this project are: OGC Web Map Service (WMS), OGC Web Feature Server (WFS), Geographic Markup Language (GML), Styled Layer Document (SLD), OGC Web Map Context Documents, ISO19115 Data Metadata, ISO19119 Service Metadata.

- **Web Services:** Web services are “software applications identified by an Universal Resource Identifier (URI), whose interfaces and binding are capable of being defined, described and discovered by XML artefacts and support direct interactions with other software applications using XML based messages via Internet-based protocols”. A typical web service application may:

- request information about a defined data type
- get the symbology applying for this data type
- portray the information using the valid symbology.

Web services are based on the Publish-Find-Bind Model which defines relations between:

- The service providers who publish a service
- The service requestors who search a service
- The service registry who matches the request with the existing service

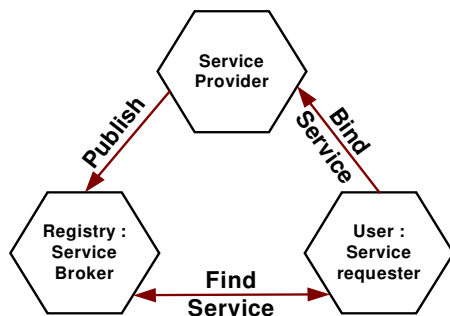


Fig 2 - The Publish-Find-Bind model diagram. Key to the discoverable Web Services paradigm.

In the Nature-GIS project Web Services are a solution:

- to empower thematic network users: building a new middleware to gather the data providers and expose their services in one unique, well defined set of interfaces will empower the community members to share their data across EC, as recommended by INSPIRE;
- To ease integration within global IT at EC and State Member levels from federal to local

(integrate with e-gov, e-business, e-security, etc.): because of its standard based approach, the Nature-GIS Network will allow any kind of organisation to be part of the network, regardless of their current infrastructure. Once they publish their data according to the defined standards and are registered inside the Nature-GIS Network Registry, they may be used as data source. The transactional interface of the Web Feature Server also allows updating data remotely. This means some bigger organisations may act as a repository for smaller one and still allows these small sized organisation to maintain their data themselves, providing a better data accuracy;

- To enable cross thematic network information exchange (sharing): members of other thematic networks who will find information relevant for their business may also query data providers inside of the Nature-GIS Network. Building on standards will allow users to query information on Nature-GIS Network and use it in their own way.

As conclusion, there are three main IT issues in building the Nature-GIS Network:

- Making services from different stakeholders interoperable: This functional interoperability can be reached by specifying a set of common interfaces to access data servers and services across the Internet. Using already defined specifications will also make the Nature-GIS network open for cross-network exchange.
- Solve some semantic interoperability problems: Those issues are not that easy to solve. We have to focus on designing a global model and make it used by every server of the federation. Using that data model, anyone may be able to find the exact meaning of every property of every object exposed on the Nature-GIS Network.
- Allow services to be discovered easily: This can be done using a Web Registry Service (WRS) to implement metadata over services and data. By registering their online services in the Nature-GIS Network Registry, data providers will become part of the federation of servers and members of the Network.