Spatial Data Infrastructures in Europe: State of play Spring 2003

Summary report of Activity 3 of a study commissioned by the EC (EUROSTAT & DGENV) in the framework of the INSPIRE initiative

August 2003

REPORT META INFORMATION

Title	Spatial Data Infrastructures in Europe: State of Play Spring 2003
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Date issued	2003-07-05
Subject	Summary of findings of activities 1 and 2 of the INSPIRE State-of-Play project
Publisher	K.U.Leuven (SADL + ICRI) + Margaret Hall consultant (HALL)
Description	This is the summary report on Spatial Data Infrastructures in Europe. It intends to reflect the state of play of SDI in Spring 2003.
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Format	MS Word 2000 (doc)
Audience	
Identifier	Rpact3v4.doc
Language	English
Coverage	Project duration

Version number	Date	Modified by	Comments
1.0	2003-07-05	Jos Van Orshoven (SADL)	First version
2.0	2003-08-04	Jos Van Orshoven (SADL)	Consolidation and integration of contributions and comments received from team members
3.0	2003-08-20	Jos Van Orshoven (SADL)	Draft final version submitted for comments of EC
4.0	2003-09-22	Jos Van Orshoven (SADL)	Consolidation and integration of comments received from team members and the EC (Mr. Vanderhaegen, Mr. Annoni)

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1. EXECUTIVE SUMMARY

Our survey of web sites and literature on NSDIs conducted for 32 European countries between September and December 2002, yielded pertinent information on various SDI-components and building blocks at various stages of development for 31 of them. For 29 of these countries, this information could be completed and corrected with the help of national GI- and SDI-experts so that by June 2003, a useful description of (N)SDIs was available. The adopted approach for information discovery does not allow to state that in the remaining 3 countries (Cyprus, Turkey and Romania) no significant SDI-developments are going on. However, if there are, there is no communication about them.

From the wealth of collected information we can conclude that operational NSDIs made up of the integrated components as identified in the GSDI-cookbook, do not exist in Europe. However, various components of NSDIs are definitely in place or being developed. This happens almost exclusively in the public sector sphere of every studied European country. Driving forces are modernization of government, modernization of NMA or similar institutions, creation or modernization of cadastres, programmes related to the promotion of e-government and information society, shortcomings in disaster prevention and management and the need to enhance and make more cost-efficient administrations.

We have come up with a classification of countries based mainly on organisational characteristics of the NSDIs, taking into account also their degree of maturity (operational, planned) (Section 7.2). Cyprus, Romania and Turkey (lack of information) and Bulgaria (unclear status of the NSDI) could not be included in the classification.

- In 18 countries, including all Scandinavian countries and most Accession Countries, a 'National Data Producer (NDP)', i.e. the NMA or a similar agency (Cadastre or Land Survey Agency) is taking the lead to (1) coordinate its traditional geodetic and mapping activities with other data producers and (2) –but to a variable extent and definitely most pronounced in the Scandinavian countries- interact with the major user groups of spatial data in order to better meet their needs. In this way, the agency fulfills an already existing, traditional, mandate of coordination or takes up a more recent formal mandate. In both cases, the awareness raising by international initiatives as GSDI and INSPIRE have had great influence although the term 'SDI' is not always used.

- Along the other line, one or more organizations other than traditional data producers, are driving the development of an NSDI, possibly RSDI. This is happening in 10 countries. Those actors are often partnerships of public sector users of spatial data aiming at overcoming financial, procedural and other barriers for sharing and re-using each other's and external data. With respect to the traditional data providers, these partnerships initially tend to act as clients. In later stages, some of the data providers may join the partnership and/or the partnership may turn to data production activities. Another variant of this type of NSDI is the mere clearinghouse like the one in Portugal, i.e. a more or less independent initiative providing information about and access to spatial data held by a wide range of data producers. Issues of data harmonisation and standardization, etc. are less pronounced for the latter variant.

Whereas NDP-led NSDIs mostly benefit from more or less guaranteed, although often decreasing, basic public funding, this is not the case for the user driven NSDI. Only in a few exceptional cases (Belgium-Flanders, Germany, Portugal) has legislation been drafted which devotes to these initiatives formal mandates and substantial funding. NDP in accession countries often have implicit mandates to develop NSDI.

The status of (digital) reference and core thematic data production and repositories is such that a workable basis is provided to start gap filling, harmonization and integration to cover the pan-European territory. Most of these data have been documented by

metadata but clearly in very variable ways. A fraction only of these metadata records are maintained in operational metadata catalogues of which –again- only part can be accessed through a web-based service. Harmonisation and standardization of data production within one data producing organisation is rather common practice. This is not the case among producing agencies. Only in the Netherlands we have found a strong example of a distributed but nevertheless well integrated and interoperable reference data production for the very large scale level. Clear organisational frameworks and division of tasks among agencies are in place in a limited number of countries (Germany, Italy, Belgium-Flanders, the Netherlands, …). Except for web-mapping, web-based services for GI are weak or inexistent. CEN, ISO and OGC are often mentioned as providing the guidelines for standardization efforts. However, concrete results of standardization is limited.

Access to metadata –as far as available- is generally free of charge. Data are provided on partial to substantial cost recovery basis and often with strict restrictions for use, formulated in a license agreement. Acquisition of GI, even by governmental bodies, often requires heavy procedures. Only few datasets can be downloaded or obtained otherwise free of charge.

Thematic environmental data are seldom fully covered by the described NSDIs. (Partial) exceptions are found in a.o. Denmark, Italy, Portugal, Sweden, Slovenia, Norway and Germany.

The role of the private sector in the described initiatives is limited to the development of sub-components and the provision of supporting services as contactors to the public sector. The only initiatives deployed independently by the private sector pertain to web mapping or rather web advertising of spatial data they hold and to some limited services like address location.

A limited assessment of the NSDIs in Australia, Canada and the United States of America and a comparison with the information gathered for NSDIs in Europe points to a number of differences. The private sector is much more consulted and present in the NSDI of Canada and Australia, and to a lesser extent also in the US, than it is in Europe. In the US, the funding model for the NSDI can be labeled as 'open access' rather than '(partial) cost recovery' which is applicable in most European countries and also in Australia and Canada. Whereas in the US, the NSDI is in the first place a federal initiative, Australia and Canada have organized their NSDI as a coordination of regional or provincial initiatives. Also in Europe more centralized (e.g. NL, HU, Scandinavian countries) and rather decentralized cases (DE, IT) our found.

A more detailed, interview-based study of how the NSDI and their components function in 9 of the 32 countries and what the perception is of the implementing agencies and the actual or potential users, has revealed that websites and publications in some cases provide information which is out-of-date or which is anticipating a future situation. It also reveals that despite the multiple SDI-projects, the GI-sector remains a very fragmented one. Producers continue to work to meet the demands of their traditional user base, not always taking care of providing high quality metadata. Novel users often agree to work with suboptimal datasets for reasons of price of the higher quality ones. In almost all countries, financial barriers, together with use and copyright restrictions have been mentioned as the major barriers for a more extensive use of GI at the lower administrative levels and outside the public sector (private sector, research, NGO's). As such, part of the investment in SDI is not turned into economic or social benefits. In all cases, efficiency gains, better policies, better protection of the environment, avoidance of reclamation costs due to prevention of environmental disasters, have been mentioned as benefits of the SDIs. To reach tangible impact and results, a NSDI-initiative is costly and seems to need at least 5 to 10 years.

Within this context, the INSPIRE-initiative of the EC has raised high expectations but also some skepticism. The expectations deal with a better affordability of spatial data and more flexible licenses for (re-)use, interoperability of datasets and information systems. Discovery and application services have lower priority. The skepticism relates to the doubts about the feasibility of the envisaged legislative and technical tasks of harmonization, standardization and creation of access.

The INSPIRE obstacles are partly acknowledged by the interviewed SDI-stakeholders. Inexistence or partial existence of some high quality spatial data and technical interoperability between geodatasets is not perceived as a major obstacle.

Within the group of 9 countries, we have found that in France, a nation-wide SDI is still a theoretical concept but that progress is being made at lower administrative levels. For the UK, we encountered a rather market oriented approach to GI and SDI-services. The private sector is interested in contributing to and making use of a NSDI but feels to be frained by unfair 'natural public sector monopolies'. Standardisation of data, data exchange and services is high on the list of priorities in CH and NL. In BE, DE, FR, UK, IT the SDI-mechanisms are heavily influenced by the increasingly federal or decentralized organization of the state. Although in BE, FR and UK, NDP are active, SDI developments are on the regional level. In DE there is a tradition of RMA and in Italy, reference GI is produced by the regional governments. Nevertheless in both countries strong initiatives are taken at the national level to coordinate the regional dynamics. HU presents the most centralized NSDI-model. In FI, current emphasis is on reaching agreements for cooperation rather than on the provision of data and services.

From an inventory and analysis of factors for success and failure of the NSDI in these 9 countries, we conclude that there is not one single solution or uniform approach for setting up a successful NSDI, i.e. an infrastructure which succeeds in delivering to the user spatial data and services at conditions which do not restrain their application. Customisation to national ways of organization is imperative. However, there seems to be a basis for a stepwise integration into an ESDI.

INSPIRE and the proposed vision and policy measures are welcomed, especially by the users of spatial data. Mainly data producers warn for over-regulation and too high expectations. In UK, FI and NL, it is even mentioned that progress of the INSPIRE-initiative is being waited for before taking further action at the national or lower levels.

2. TABLE OF CONTENTS

3. ABBREVIATIONS AND ACRONYMS

The following list presents the abbrevations and acronyms commonly used in this report. Abbreviations and acronyms used in the annexed country reports are listed in those reports.

DGEnv	Directorate-General of the Environment (EC)
EC	European Commission
EFTA	European Free Trade Association
ESDI	European Spatial Data Infrastructure
EU	European Union
FIR	Further Investigation Required
FOI	Freedom of Information
GI	Geographical Information
GII	Geographical Information Infrastructure
GINIE	Geographic Information Network in Europe
GIS	Geographic Information System
GMES	Global Monitoring of Environment and Sustainability
GSDI	Global Spatial Data Infrastructure
GISEE	GIS-technology and market in south-Eastern Europe
INSPIRE	Infrastructure for Spatial Information in Europe
ISO	International Standards Organisation
JRC	Joint Research Centre of the European Commission
LSDI	Local Spatial Data Infrasturcture
NA	Not Applicable
NDP	National Data Producer
NMA	National Mapping Agency
NGO	Non Governmental Organisation
NIA	No Information Available
(N)SDI	(National) Spatial Data Infrastructure
PPP	Public-Private Partnership
PSI	Public Sector Information
RMA	Regional Mapping Agency
RSDI	Regional Spatial Data Infrastructure
TEN	Trans European Network
TSDI	Thematic Spatial Data Infrastructure

4. INTRODUCTION

Although today many GI-producing and -using organizations across the globe and in Europe in particular have taken the step to GIS-technology, experience for the last 2 decades has made clear that the accessibility, interoperability and affordability of the spatial data and information systems are limited. It is generally recognised that this situation prevents society to fully benefit from the evident potential of the technology to improve the relevancy, accuracy, impact and public control of territorial policies and related decisions and to involve citizens, businesses, non governmental and research organisations in a participatory information society. A move away from the commonly isolated and scattered approaches to production, management, dissemination and use of geographic information is considered to be required.

The concept of 'Spatial Data Infrastructure' has been formulated to indicate the set of both technical and non-technical conditions which, besides the availability of the technology, must be fulfilled to allow for the full deployment of the GIS-potential in a society perspective.

With the INSPIRE initiative, the European Commission intends to trigger the creation of a European Spatial Data Infrastructure that will allow the public sector users at the European, national, regional and local levels, users in private, research and NGO-environments and the citizen, to discover, access and acquire spatial data from a wide range of sources in an interoperable way for a variety of uses at conditions which do not restrain its use. The EC and the INSPIRE expert groups firmly recognize that the building blocks for such an ESDI consist of the operational or emerging national, regional and local SDI.

This report presents the state of play in Spring of 2003, of SDIs and their building blocks in 32 European countries, i.e. the 15 EU-Member States, 10 EU-Accession Countries, 3 EU-Candidate Countries and the 4 EFTA-Countries. In the first place, the state of play of the well-structured general purpose SDI-efforts which are planned or ongoing at the national public sector level is described. For 9 of those countries, the functioning of these NSDI-initiatives is studied in more detail and, in order to better appreciate the SDI-situation in those 9 countries, some of the regional, local or thematic SDI have been studied as well.

The report is conceived as follows:

- In the next (fifth) chapter, a workable definition of 'SDI' is given, together with a set of diagnostic characteristics, allowing to distinguish 'true' SDIs from less developed initiatives. Since complete SDIs are scarce in Europe, most described initiatives deal with components of an SDI or are rather SDI-like. From these definitions, the objectives and assumptions of the study are made explicit;

- The sixth chapter relates to the 'materials and methods' for this study. The approach and methods are presented used to (i) collect the relevant information and process it into country reports, (ii) elaborate a simple typology for the studied SDIs, SDI-components and SDI-likes, (iii) obtain more detailed information about the functioning of (N)SDIs in 9 countries and (iv) appreciate the potential impact of INSPIRE for the studied initiatives;

- The results are summarized in chapter seven. It provides a summary overview of the state of play of SDI for each of the 32 countries. The outcome of the typology is presented. Some factors of success and failure for the (N)SDI in 9 of the 32 countries are listed. The potential impact of the proposed INSPIRE-measures to the studied (N)SDIs is addressed.

- From the findings, a number of recommendations are formulated in chapter eight.

- The annexes to this report are important. First there is a proposal on how to monitor the evolution of the described (N)SDI in the coming two years. In separate volumes, the 32 general country reports and the 9 so-called dedicated

country reports, emphasising the functioning, use and efficiency of the (N)SDI, are presented. Finally a comparative report on the SDI-situation in Australia, Canada and the United States of America is included.

- An executive summary, which can also be read in terms of a number of conclusions of the study, is available as the first chapter.

5. DEFINITIONS FOR AND OBJECTIVES OF THE STUDY

5.1 What is an SDI and what are its diagnostic properties?

Whereas in the past Geographic Information Systems (GIS) were largely designed to serve specific organizations or projects, the focus of the GI-community is now increasingly shifting to the challenges associated with integrating these individual systems into a space and time independent continuum to support the agendas, ambitions and perspectives of (1) public authorities and administrations at various levels, (2) thematic user communities, (3) enterprises and (4) citizen-oriented society as a whole. The term "Spatial Data Infrastructure (SDI)" is used to describe the outcome of such endeavour. Besides GIS-technology, Intra- or Internet-based communication technology is crucial for an SDI.

According to the GSDI Cookbook[1] an SDI is the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data. According to this definition, largely referred to in EC-documents, an SDI includes several components:

- Geographic data and attributes, organized in distributed repositories;

- Sufficient documentation (metadata);

- A means to discover, visualise and evaluate the data (catalogues and web mapping);

- Some method to provide access to the geographic data and

- A set of agreements on the technical (standards), organizational and legal issues, needed to coordinate and administer spatial data, information and services on a local, regional, national or transnational scale.

The INSPIRE-initiative pays particular attention to data needed for environmental policy making. These include reference and core thematic data but also more typical environmental data.

All these components are also reflected in the mandates of thematic expert groups which have delivered the so-called INSPIRE position papers in October 2002. The themes those expert groups dealt with were:

- Reference data and metadata;

- Data policy and legal issues;

- Implementing structures and funding;

- Architecture and standards;

- Environmental thematic user needs;

- Impact analysis.

Whereas, the above definition and components describe in general terms, the diagnostic characteristics of a full-blown, theoretical SDI, for many ongoing SDI-initiatives not all components are in place and the extent of development of the available components may be more limited.

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[1] "Developing Spatial Data Infrastructures: the SDI Cookbook", version 1.1 of 15 May 2001 (http://www.gsdi.org/pubs/cookbook/cookbook0515.pdf)

An SDI is meant to help avoid fragmentation, gaps in availability of GI, duplication of data collection and problems of identifying, accessing or using the available data. An SDI addresses thus both technical and non-technical issues, ranging from technical standards and protocols, organisational issues, data policy issues including data access policy and the creation and maintenance of GI for a wide range of themes.

Such an SDI involves producers and users of spatial data and information systems in some form of partnership. It needs a strategy and a common toolset to deliver integrated spatial information services to meet the needs of users in the public, private, non governmental and research sectors and of individual citizens, allowing them to easily identify, access and use GI from a wide range of sources in an interoperable way.

SDIs may be developed from the initiative of a partnership of producers of spatial data. This approach leads to agreements among data producers as to be able to offer a more complete and interoperable package of data and services to the user or client communities. An SDI-initiative may also be user driven in the sense that user communities and organizations organize themselves into partnerships to enter in a negotiation process with the various data producers so that products and services of the latter better meet the users' needs. The most far reaching SDI is of course reached when users and producers of spatial data are mobilized and organized to develop a common framework of agreements on data content, standardization, … Since many data producers are at the same time users of data of their own or of third parties and since typical data users often tend to turn to production of data which are not offered on the GI-market, this type of mixed SDI is not exceptional.

SDIs can be developed for different spatial extents and for general or specific thematic user communities. General purpose SDI, which are designed to serve a wide range of user types, are subdivided according to the extent of the territory they cover: Global SDI (GSDI), Multi-national, National (NSDI), Regional (RSDI) and Local SDI (LSDI). These types of SDIs are almost exclusively in the public sphere and emphasise the topographic reference and core thematic data. SDI oriented towards thematic user communities or large enterprises will be rather termed Thematic SDI (TSDI) or Enterprise SDI. This study focuses NSDI-initiatives.

5.2 NSDI- and NSDI-like initiatives

NSDIs –fully compliant with the above definition and having all components in place- are scarce. If this study would be limited to describing those countries that already have in place or have planned such full-blown NSDI, then only a handful of countries would be addressed. Portugal and the Netherlands are often cited as countries having developed a complete NSDI. A closer look however reveals that each has taken a completely different approach and that in neither case, all components of a theoretical SDI are in place or even planned.

An SDI consists of many elements and most countries are in the progress of developing or have made plans to develop some -but not all- of these elements. Most NSDI initiatives can therefore better be described as SDI-like or SDI-supporting initiatives. For example, often the mandate to develop a nation-wide SDI has not been given so that one or more organisations take SDI-like initiatives without clear strategy or framework in place. Other countries are currently still in the initial stage of developing cadastral services and/or Land Information Systems (LIS), which often is an important element for the data component of a functional SDI. It is clear that most countries are at different stages in their development of a NSDI. We have opted to not only describe the well-structured ongoing or planned NSDI efforts, but also some of the more limited and less structured initiatives and some Regional SDIs.

It should also be noted that the creation of an SDI is an evolutionary process. Even if at one moment in time a full-scale SDI is functioning well, it still has to be maintained and kept up-to-date. The implementation of an SDI is thus definitely not a once-off effort but a process that sometimes proceeds in unanticipated ways.

Different types of NSDIs or NSDI-like initiatives are possible. Each country has a specific socio-economic, technological and political context. No two countries are alike in the way they handle geographic information. A unique genesis of the national

mapping agency, an original view on the tasks of the public sector, a decentralised or centralised state structure, the maturity of the national information market... all these elements will influence the final outcome of the NSDI. Moreover, the particular challenges vary for each country which affects the way they tailor their approach to NSDI. Because of the uniqueness of each country, the gained benefits and expected bottlenecks for implementation will also be different and hence the best strategies for implementing a NSDI may differ for each country.

5.3 Objectives of the study

The general objective of the study is to identify, describe and compare the current status of the NSDI in the different Member States of the EU, in the Accession and Candidate Countries and the EFTA Countries. This general objective is reflected in five concrete objectives:

1. The description of the status of the NSDI and their components in these 32 European countries;

2. An analysis of how the NSDIs are functioning in nine selected countries;

3. A mutual comparison of the situation in the different countries and a limited comparison with the situation in Canada, the United States of America and Australia;

4. The formulation of recommendations for integrating the different infrastructures in an ESDI and

5. The proposal of a methodology to monitor the technical and organisational evolution of the NSDIs.

Objectives 1 and 2 were the focus of Activity 1 resp. Activity 2 of the study. Activity 3 was devoted to reaching the three remaining objectives.

The compilation of the readily available information under Activity 1 was presented in the first report (February 2003). The goal was to systematically collect and structure the readily available, trustworthy and useful information on existing and planned NSDI with respect to their approach, components, implementation scheme, involved organisations, public and private users. An update of this information is presented in this report. Since we have been working with non-homogeneous and non-exhaustive information sources, we do not claim to have obtained complete information on all existing NSDI-related initiatives in all countries.

Based on the information compiled under objective 1, the other objectives have been pursued. The results of the related activities are reported upon in this report.

5.4 Assumptions of the study

Throughout all activities of this study, the emphasis has been on general purpose SDI-initiatives, i.e. SDIs for which the promotion of the sharing and re-use of reference and core thematic data is the core activity. In all countries, this type of SDI is developed mainly by public sector players. SDIs focusing thematic environmental data have also been considered but other types of thematic SDI have only been mentioned. Secondly, attention was focused on initiatives focusing the national scale, i.e. NSDI, rather than lower level initiatives

However in the scope of Activity 1, when a national SDI is clearly lacking and regional SDIs are strongly developed, we did not limit to stating that no NSDI exists, but instead focused on either the most important, best developed or the most representative lower level SDIs in that country. Especially in decentralised countries regional SDIs are often pertinently present. For example, although efforts are made in Spain to develop a NSDI, we included a description of the more advanced regional SDI-initiative of Catalunya. In the case of Belgium the three regions (Flanders, Wallonia and Brussels) are each independently developing their own SDI and these initiatives are hence described.

In Activity 1 only existing information, i.e. freely accessible resources and known contacts are used to compile the state of play.

Within Activities 2 and 3, the possible existence of lower level (local or regional) and thematic SDIs is explicitly considered and their interconnection with national initiatives described. Besides information which is on-line available or published in common reports and other documents, also non readily available information has been mobilised, mainly through face-to-face interviews.

6. APPROACH

6.1 Identification and description of (N)SDI-initiatives in 32 countries

From the reference characteristics of the five components of an ESDI (Legal Framework and Funding Mechanism, Geographic data (i.e. Reference and Core Thematic Data, Thematic Environmental Data), Metadata, Access Services, Standards) as identified in the final version of the Position Papers of five of the INSPIRE working groups[2] we compiled an exhaustive list of items according to which the (N)SDIs could be described. This resulted in a so-called check-list based on which the relevant elements could be extracted from the consulted information sources. After rearranging, the list was used as the template for the description of the (N)SDI in the country reports.

The description was performed in two stages, resulting in a first and a second version of the country report. Compared to the structure of the first version, the second is extended by sections containing report meta-information, an executive summary and a section on the method used to compile the report. Section titles for which no information could be found have been dropped in the second version.

In the first stage (September – December 2002), the country reports were compiled based on the consultation of various web sites, documents and project references readily accessible. Most resources were gathered from the internet.

Since for some countries, almost no information could be found in this way, some key persons were contacted. However this could not be done for all countries in the limited time frame. In addition, a list of information sources has been sent to all INSPIRE Working Group members in order to get feedback about its completeness. Sporadically, new data sources could be identified that way.

31 country reports (Switzerland and Liechtenstein were combined in 1 report) resulted from the first stage. This means that in every country at least one NSDI- or NSDI-related initiative was found. In each of them, the consulted information sources are listed in the last chapter.

In the second stage (April-June 2003), the country reports were submitted to experts in each of the 32 countries. The experts were identified through the INSPIRE expert committee. In some countries, the report was handed over to other organizations and persons for further update. In this way, for most of the reports, corrections and updates were provided. The name and affiliation of the contributing experts is available in the second version reports which are annexed to this summary report (Annex 11.2).

Through the visits to the nine countries performed in the scope of Activity 2, some extra information could be collected which, where relevant, was added to the country reports.

6.2 Comparative summary of the (N)SDI

A subset of the information gathered through Activity 1 is presented by country in an overview table (Table 2 in Section 7.1). The presented items relate to a number of organizational issues and to the five generic components of an SDI (see Section 5.1). They can be considered as the building blocks of the SDI under study. The items or building blocks are expressed as statements (see Table 1) and the assessment of the

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[2] The five INSPIRE working groups dealt with Architecture and Standards, Data Policy and Legal Issues, Implementation Structures and Funding, Reference Data and Metadata, Environmental Thematic User Needs)

studied SDI-initiative has been made in terms of whether it is (1) in full agreement with the statement, (2) in partial agreement, (3) not in agreement or (4) whether not sufficient information is available for assessing the level of agreement.

With this type of rating, reality is of course simplified. E.g. the fact that a particular NSDI is evaluated as being in agreement with the three statements about the metadata component only means that substantial work has been done in relation to metadata. This implies that the practical meaning of these 'indicators' to assess progress made over time with respect to metadata production and implementation, is limited.

For every country a NSDI-initiative is assessed, except for Belgium. In Belgium 3 regional initiatives are being developed which together cover the entire country. The scope of these regional initiatives is much larger than the initiative at national level which at present is not consolidated. In other countries (Germany, Spain), significant regional initiatives are also deployed. However, since the collected information on these regional initiatives does not cover the entire countries and since at the national level in those countries, relevant activities are ongoing or planned sometimes aiming at interconnecting the regional projects, we have assessed the national level.

6.3 Typology of (N)SDI in 32 countries

The primary goal of the typology is to recognise the different types of SDI to allow the assessment of their potential contribution for the development and implementation of a successful future European SDI.

Although the information gathered in the first stage (September – December 2002) could in no way be considered as being complete for most of the countries, an attempt was already made by then (see first summary report) to group the countries according to similarity of their NSDI-initiatives, i.e. to label them according to a 'type'. This provisional typology was based on criteria related to the coordination aspects of the NSDI-initiatives.

For the update of the typology, we still emphasize the matters of coordination since it is obvious that coordination is the major success factor for each SDI and since coordination is tackled in different ways according to the political and administrative organization of the country. The way an SDI-initiative is coordinated is undoubtedly one of its more stable characteristics. In order to make the typology also useful for monitoring purposes, the degree of 'operationality' of the SDI is also taken into account. The latter is a rather subjective assessment of the level of the services the SDI is providing, which is derived from the assessment of the building blocks of the SDI in Table 2. It does not mean that all characteristics of NSDIs as can be derived from the INSPIRE-position papers, are in place. It rather means that production of GI is coordinated to at least a certain extent and that users of GI are supported in finding and re-using GI trough SDI-mechanisms.

Another argument for using this approach to typology is more functional. Since the ESDI will aim at a coordination of NSDIs, i.e. a coordination of coordinating initiatives, this grouping of countries already provides information on the way this challenge can be tackled.

From the more complete description of the status of SDIs, it is obvious that in almost every European country (Bulgaria is an exception to this), an organization of the NDP-type (NMA, Land Survey Service, Cadastral Agency) is present having the formal mandate to, a.o. maintain the national geodetic reference system, produce topographic reference data and –often- coordinate with data production and dissemination by other players. As such the NDP has an implicit mandate to set up an SDI, albeit mainly from the producers' perspective. We consider this as the most basic level of SDIs. User communities may or may not be present in steering committees and/or advisory boards for the NDP and NSDI. A GI-association may or may not exist, be active or not.

We distinguish countries with this type of GI-coordination from those were, of course NDP are also present, but where the NMA or another traditional data producer is not the main coordinator of the NSDI. In those countries the SDI is rather driven by a council of ministries or administrative departments, a GI-association or another type of partnership of –mainly- data users. Fundamental to this type of SDI-initiative is that the

participants are willing to share each other's spatial data and those acquired from third parties and to remove the obstacles preventing this. From this perspective, participants are mainly users of GI which they acquire at the data producers. The initiative may result in a joint framework for negotiation of the SDI-participants with the data providers for optimal conditions of data characteristics, use and re-use, price, access. Such partnerships may be based on (i) a formal mandate or law, (ii) a (temporary) project agreement or (iii) voluntary contributions.

In each distinguished group, the degree of operationality as derived from the presence and accessibility of the other SDI-components is included as a further discriminating factor.

Countries for which no feedback was received from national experts have not been included in this typology effort, i.e. Cyprus, Turkey, Romania.

6.4 Detailed description and evaluation of (N)SDI in 9 countries

In the frame of the second activity of the study, on-site visits have been performed to SDI-players in nine of the 32 countries in order to gain a better understanding of how these SDIs are functioning in practice. On-line or printed information is indeed often out of date or presenting a future situation which is not yet implemented or which will never be implemented since plans have not been confirmed or updated. In addition, those visits provided the opportunity to (1) verify, update and complete the 9 country reports, (2) collect more detailed qualitative and quantitative information on applications of the SDIs, intensity of use, benefits and costs and ultimately (3) appreciate the value of the federal, regional, thematic and project-based (i.e. temporary) SDIs as contributions to good governance at national, regional and local level and as building blocks for a European SDI.

6.4.1 Selection of the countries

Although a typology of NSDIs would be an appropriate help for selecting countries for a more in-depth study, it was obvious that the typology available after the first stage of the study was still too unstable for that purpose. Therefore, the selection was rather based on following considerations:

- Since the aim of Activity 2 was to study in more detail SDI-models which can contribute to a successful implementation of the ESDI, only countries with a reasonable level of SDI development and a considerable degree of 'operationality' were taken into consideration;

- A successful ESDI will require strong cooperation between separate national SDIs. From this perspective, it was considered useful to visit countries which have developed SDI at the regional or even at the local level, and which are investigating and implementing cooperation between these several lower-level SDIs;

- Although definitely not a decisive factor, the geographical (north-south, east-west, size) and political situation of the countries was taken into account since it is related to language, governmental culture, … which are recognized to be important elements for the functioning of an SDI.

Countries having (N)SDIs which are not formally coordinated and which are in an initial stage or have no clear plans to formalize the (N)SDI strategy and operation and countries for which not sufficient information was found to further characterize the SDI-related initatives were not considered for detailed study.

From the remaining candidates nine were retained: France, Germany, Finland, Switzerland, Hungary, the Netherlands, the United Kingdom, Italy and Belgium. The motivation is based on the fact that these countries:

- present a geographical cross cut through Europe (FI to IT, UK to HU),

- include countries of different sizes and population density (BE, CH versus FR, UK, DE, IT),
- include an Accession Country (HU) and an EFTA-country (CH),
- and not in the least, cover:
    - various 'business' models for the SDI (e.g. UK versus FR),
    - various complexity levels (e.g. CH versus HU) and
    - various levels of (de)centralization with respect to SDI (DE, BE, CH versus NL, HU).

The in depth-study of Italy's SDI was not developed by the the contractor but by the Joint Research Centre of the EC.

6.4.2 On-site interviews

The on-site interviews were conducted by one or two members of the contractor's team. Also a limited number of telephonic interviews were done. In a few occasions, the team could participate in SDI-committee meetings.

Visits and interviews were reported upon in a standardized way. Respondents have had the opportunity to provide feedback. The interview reports are annexed to the resulting dedicated country reports (Annex 11.3).

The country report was 'revisited' with high level administrations or agencies, having a broad view on the national SDI-scene. In some cases, the an updated or commented version of the country report was provided before or after the visit. The collection of more detailed information and the appreciation of the value for the ESDI of the building blocks of the (N)SDI were pursued on a 'sample' basis, given the fact that the available time did not allow for an more exhaustive survey. Organizations and individuals, belonging to different 'strata' defined in terms of the type of organisations contributing to or benefiting from the SDIs, were contacted. Those strata were:

- Agencies or companies implementing the SDIs;
- Public sector users of the SDIs at national, regional and municipal level; environmental agencies;
- Private sector users from industry (requiring spatial data for their primary production processes) and GI-service providers;
- Research organizations;
- Non-governmental organizations.

Almost each bi- or multilateral interview started with the presentation by the contractor of his/her perception of the SDI-initiatives in the country and of the perceived role of the respondent in it. Consequently, a number of issues were addressed, tailor-made to the specific type of respondent. In almost every interview, a substantial amount of information was provided on the functioning of the SDI at hand. By hence selectively introducing issues for discussion, the five obstacles which the INSPIRE framework legislation intends to address, were implicitly reviewed: (1) spatial data gaps, (2) lack of data documentation, (3) incompatibility/lack of interoperability of spatial datasets, (4) lack of coordination between scattered GIS- and SDI-initiatives, (5) procedural, legal and financial barriers for access to and use of spatial data. We systematically enquired about the costs and benefits of the existing SDI and the post-INSPIRE SDI, and also asked for documented cases of use of the SDI and examples of application services of the SDI.

The visits & face-to-face interviews definitely helped to understand the nature and functioning of SDIs but did only yield limited quantitative information on costs and benefits.

6.4.3 Evaluation

The full dedicated country reports, including the interview reports are annexed to this report. In order to summarise the lessons learnt, we present in Section 7.3 the

mentioned (by the respondents) and the perceived (by the contractor) factors for success and failure of the NSDI-initiatives in the studied countries.

6.5 Appreciation of the proposed INSPIRE measures to support the further development of the (N)SDIs in 9 countries

Besides an appreciation of the (N)SDIs and (N)SDI-components in place in the 9 visited countries, also the policy measures which INSPIRE proposes to tackle the 5 crucial generic obstacles for building an ESDI from the national initiatives were discussed during the interviews. We first recall the obstacles and the policy measures which are proposed to address them. In Section 7.4 we present a summary of the position of the visited stakeholders.

Obstacle 1: Spatial data gaps

- Full European coverage for certain datasets in accordance with minimum quality criteria is essential for efficient use of data from a variety of sources. However, there remain important gaps in Europe even for the most essential spatial datasets.

Proposed INSPIRE Policy measure:

1. *INSPIRE should set the framework for requiring for spatial datasets full EU coverage in accordance with agreed data collection methods and quality criteria. These requirements would not be part of the INSPIRE framework legislation, but be adopted at later stages through separate legislative processes. The INSPIRE Framework legislation would only refer to the establishment of these future requirements.*

Obstacle 2: Data documentation is often lacking

In many cases, data documentation does not exist, making it impossible to find back possibly valuable information; existing data documentation is available in a variety of formats

Proposed INSPIRE Policy measures:

2. *Metadata needs to be made available in order to help users identify and locate relevant datasets. Building on this, INSPIRE would require that in the short term, the most important spatial datasets and in the medium term the other spatial datasets corresponding to the selected themes are documented according to common standards and that the metadata is kept up to date. Metadata should allow discovering relevant datasets and provide information on access and use.*

3. *Metadata should be made available free of charge for all users*

Obstacle 3: Spatial datasets are not compatible/interoperable

Most uses of spatial data require data from various sources but data from various sources is often not compatible. This requires repeated adaptation of data sources or discourages the use of the spatial data.

Proposed INSPIRE Policy measures:

4. *Member States would be required to contribute to the definition of standard ways of organising and presenting spatial datasets. (These standards would take the form of common dataset specifications, based on common data models.)*

5. *Member States would be required to use these specifications for any new data collection, or update of existing data, within the selected data themes. Member States would also be expected to make their existing spatial datasets compatible with these common dataset specifications, in the medium term for the most*

important datasets and in the long term for the other spatial datasets. Member States could do this in the first instance by building connectors to their existing databases so that they can be registered with Web-enabled services and becomes INSPIRE compliant. In the longer run, there will be benefits in upgrading national and local standards to international best practice as reflected in the INSPIRE specifications

6. *The data and information needed to make spatial datasets inter-operable should be made available free of charge and be free of use restrictions.*

7. *The datasets on administrative boundaries that can be used as a reference for seamless integration of other spatial datasets should be made available free of charge and free of use restrictions*

Obstacle 4: GIS initiatives in Europe are often incompatible

Technology progress allows us today an integrated discovery, access and use of spatial data from different sources, located at different sites. Several communities have set up their own mechanisms for exchanging spatial data, but often these initiatives are not co-ordinated across the boundaries of the communities involved, leading to duplication and forgone potential economies of scale. In Europe, an overarching initiative is needed that will bring together the existing and emerging initiatives into one consistent framework.

Proposed INSPIRE Policy measures:

8. *Member States would be required to establish a distributed network of services that publish, discover, view, access and trade the spatial datasets that are covered by INSPIRE, in accordance with common standards.*

9. *This network should be open to non-public sector providers of spatial datasets and to spatial data that falls outside the selected themes that are consistent with a minimum set of conditions needed to ensure the overall consistency and ease of access to the Spatial Data Infrastructure. Such conditions could include compliance with metadata standards, conditions for access to metadata and view of data (see below) and implementation of INSPIRE network services.*

10. *The Commission would need to establish and operate an "EU-Portal" that would provide a multilingual point of access to the spatial data and services accessible through the network.*

Obstacle 5: Barriers for use

Important barriers exist of a procedural, legal or financial nature for access and use of spatial data, even between public sector bodies. There is often no culture of sharing of information between public sector bodies. Therefore possibilities for reuse of information between different level of government are limited, leading to duplication of data collection and maintenance. In addition, many public bodies apply prohibitive charges or licensing conditions for the reuse of spatial data (including to other public bodies).

Proposed INSPIRE Policy Measures

11. *In view of the objectives of INSPIRE to support governance in Europe, Member States would be required to establish a framework for sharing spatial data between public sector bodies that provides:*
    - *for all public sector bodies, exchange of spatial data that is free of barriers of a transactional, procedural, legal, institutional or financial nature at the point of use.*
    - *for unrestricted use rights for public sector bodies related to the performance of their public tasks.*

12. *In complement to a sharing framework between public bodies, a more general licensing framework governing all spatial data of the infrastructure would be established by INSPIRE.*

13. *In order to make the spatial data infrastructures efficient and appealing from a user point of view, viewing of all datasets corresponding to the selected themes should be free of charge to all users. Viewing means the display on a screen of the visual aspects of the data, with appropriate legends needed for interpretation. It does not mean download of a copy of the data in its native format or visualisation of all the textual and numerical attributes (e.g. measurements).*

Additional measures

Implementing the above measures will require further provisions in the INSPIRE legislation in order to deal with methods, standards and organisational issues, including the creation of a solid framework within which providers and users from various sectors can co-ordinate spatial data requirements and provision.

The INSPIRE legislation would therefore need to establish a flexible procedure for the adoption of the necessary implementation measures. These include the adoption of guidelines for reporting to the Commission of the common dataset specifications, data models and standards for documenting, organising and representing spatial data, of technical standards for services for discovery, viewing and downloading of spatial data and of implementation schedules for standardisation work.

Furthermore, INSPIRE would require the Member States to monitor, on a continuous basis, and according to common rules, the development of the spatial data infrastructure as regards the availability of spatial datasets and services.

7. STATE OF PLAY OF SDIs, SPRING 2003

7.1 Summary overview of state of play

Table 2 contains a summary of the information compiled for the (N)SDIs in 32 European countries. Colours indicate whether the studied (N)SDIs are in large, partial or no agreement with the statements about the SDI-building blocks introduced in Section 6.2 and presented in Table 1.

Apart from Turkey, significant information has been compiled for all investigated countries. Organisational issues and items related to metadata and access services are well covered. Although legislation on freedom of information, copyright and protection of privacy has been reviewed, few elements have been found specifically pertaining to GI. For issues of data quality and interoperability, information is lacking for several countries.

I. Organisational issues		
Level of SDI	1	The approach and territorial coverage of the SDI is truly national
Degree of operationality	2	One or more components of the SDI have reached a significant level of operationality
Coordination	3	The officially recognised or de facto coordinating body of the SDI is a NDP, i.e. a NMA or a comparable organisation (Cadastral or Land Survey Agency, i.e. a major producer of GI)
	4	The officially recognised or de facto coordinating body for the SDI is an organisation controlled by data users
	5	An organisation of the type 'national GI-association' is involved in the coordination of the SDI
Participants	6	Producers and users of spatial data are participating in the SDI
	7	Only public sector actors are participating in the SDI

Table 1: Selected building blocks for an SDI

II. Legal issues and funding		
Legal framework	8	There is a legal instrument or framework determining the SDI-strategy or -development
Public-private partnerships (PPP)	9	There are true PPP's or other cofinancing mechanisms between public and private sector bodies with respect to the development and operation of the SDI-related projects
Policy and legislation on access to public sector information (PSI)	10	There is a freedom of information (FOI) act which contains specific FOI legislation for the GI-sector
Legal protection of GI by intellectual property rights	11	GI can specifically be protected by copyright
Restricted access to GI further to the legal protection of privacy	12	Privacy laws are actively being taken into account by the holders of GI
Data licencing	13	There is a framework or policy for sharing GI between public institutions
	14	There are simplified and standardised licences for personal use
Funding model for the SDI and pricing policy	15	The long-term financial security of the SDI-initiative is secured
	16	There is a pricing framework for trading, using and/or commercialising GI

Table 1 (continued): Selected building blocks for an SDI

III. Reference Data & Core Thematic Data		
Scale and resolution	17	Geodatasets exist which provide a basis for contributing to the coverage of pan-Europe for the INSPIRE-selected data themes and components
Geodetic reference systems and projections	18	The geodetic reference system and projection systems are standardised, documented and interconvertable
Quality of reference data & core thematic data	19	There is a documented data quality control procedure applied at the level of the SDI
Interoperability	20	Concern for interoperability goes beyond conversion between different data formats
Language and culture	21	The national language is the operational language of the SDI
	22	English is used as secondary language

IV. Metadata for reference data and core thematic data		
Availability of metadata	23	Metadata are produced for a significant fraction of geodatasets of reference data and core thematic data
Metadata catalogue availability + standard	24	One or more standardised metadata catalogues are available covering more than one data producing agency
Metadata implementation	25	There is a coordinating authority for metadata implementation at the level of the SDI

V. Access and other services for reference data, core thematic data and their metadata		
Metadata	26	There are one or more on-line access services for metadata on reference data and core thematic data
Data	27	There are one ore more on-line access services for reference data and core thematic data
Web mapping	28	There are one or more web mapping services available for reference data and core thematic data

VI. Standards		
Standards	29	The SDI-initiative is devoting significant attention to standardisation issues

Table 1 (continued): Selected building blocks for an SDI

VII. Thematic environmental data		
Thematic Environmental data	30	Thematic environmental data are covered by the described SDI-initiative or there is an independent thematic environmental SDI

Table 1 (continued): Selected building blocks for an SDI

Table 2: Assessment of the building blocks of NSDI

Legend:
- In agreement
- In partial agreement
- Not in agreement
- Unknown

7.2 Typology

The classification rules set out in Section 6.3 lead to two distinct groups of countries. In countries of the first group, a NDP (NMA or a similar type of agency like a National Land Service, Cadastral Agency, ...) is the officially mandated or de facto leading organization for the establishment of the NSDI. At a second level, the further involvement of associations or communities of data users in the coordination activities is taken into account. Involvement in this respect means that user organizations are present in bodies defining the mandate of the lead agency for the NSDI and/or advising upon the NSDI-projects. Finally the degree of operationality of the SDi-initiative, i.e. whether one or more of its components are operational or whether the NSDI is rather in the planning stage, is considered.

The second group of countries have NSDI-initiative(s) led by a council of ministries or administrative departments, by a (non governmental) GI-association or other type of partnership of mainly data users. This group is further subdivided according to the presence or absence of a legal or otherwise formal mandate for the SDI-coordination. At the third level, the operationality of the initiative is used as a discriminating factor.

Since for Cyprus, Romania and Turkey no feedback was received for the country report, the collected information is regarded as not being consolidated and therefore these countries are not included in the typology. Bulgaria is not classified since it is not clear at all whether there is coordination, and if yes, which is the coordination mechanism for the few SDI-related projects.

Level I	Level II	Level III	EU-15	EU+10	EFTA-4	Class
NDP-led	users involved	operational	DK, FI, SE	HU	IS, NO	1,1,1
		partially operational	AT,	CZ, PL		1,1,2
		not operational	GR, LU			1,1,3
	users not involved	operational		SI		1,2,1
		partially operational		LT	LI	1,2,2
		not operational		EE, LV, MT, SK		1,2,3
not NDP-led	formal mandate	operational	BE-VL, DE, PT		CH	2,1,1
		partially operational	IE, IT			2,1,2
		not operational				2,1,3
	no formal mandate	operational	NL, UK			2,2,1
		partially operational	BE-WA			2,2,2
		not operational	ES, FR			2,2,3

Table 3: Classification of countries according to type of NSDI

Eightteen, i.e. more than half of the selected NSDI-initiatives are NDP-led. This is the case for all accession countries, Iceland and all four Scandinavian countries. The role of the NMA in Finland is less pronounced though. Three EU-15 countries are also in this group: Greece, Austria and Luxembourg. NSDI in all Scandinavian countries and in Iceland explicitly include the data users in the coordination process and all have operational components in place. Also in Greece, Austria and Luxembourg and in the larger Accession Countries (Poland, Hungary and Czech Republic) users are (to a variable extent) present in the coordination bodies for the NSDI. In Greece and Luxembourg, the NSDI-project is not sufficiently advanced to yield operational components.

Nine of the EU-15 countries and Switzerland have not mandated –officially nor de facto- a NDP to coordinate the NSDI. In the Netherlands and Ireland, an association of GI-sector stakeholders of the NGO-type is taking the lead. In NL, this coordinator has no formal mandate but has nevertheless succeeded in making a NSDI operational for large scale reference data. The same is true for the UK although it is difficult to point out for that country whether there is an agency really taking the lead and, if yes, which organization it is. The NMA plays an important role but other types of organizations as well. In three countries (DE, PT and BE-VL), a governmental interdepartmental body is formally mandated to build and coordinate the NSDI and has reached a status of

operationality. France presents a special case. The NMA is not formally mandated and even refusing to coordinate the NSDI-development. Coordination is in the hand of an advisory body which succeeds in creating awareness but not in mobilising the national GI-sector in a cooperative SDI-undertaking. The Spanish NSDI is in an early stage of development. The NMA plays an important role but the strategy is developed by an interministerial council.

This typology is of course not fully waterproof. In some cases there are arguments to attribute the country to more than one class. In Hungary for example, the Ministry of Agriculture and Rural Development leads the NSDI together with the Ministry of Informatics and Communication. But it is the National Mapping Agency, FÖMI[3], that is technically taking the lead. The same is true for Germany where the SDI is coordinated by the IMAGI in which all the federal Ministries dealing with GI are represented, but the secretariat is within the Bundesamt für Kartografie und Geodesie.

7.3 Factors for (non-)success of (N)SDIs in nine countries

7.3.1 Belgium

Success is expressed in terms of gains of efficiency, facilitation of e-government, modernisation of governmental services and the establishment of closer links with the citizen. Increased use of data (e.g. cadastral data) is mentioned as an important benefit. It leads to a higher return on investment in the data and the increased use leads to an increase in their quality.

(+) Stakeholders in the three Belgian RSDI point to the regional character of the SDI as being a condition sine qua non for success. Since in Belgium territorial matters are increasingly dealt with by the regional government and administrations, user needs and political sensitivity in the three regions may indeed be significantly different and require a different approach to an SDI.

(+) The financial issue is important, but less counterproductive than in some other countries. The regional governments have indeed assumed responsibility for the elaboration of the RSDI and adhere to marginal cost recovery only.

(-) From the national level, the lack of respect for the division of responsibilities between the regional and federal level is mentioned as a factor for non-sustainability of the regional initiatives. As such procedural aspects seem to be the most compromising for the RSDIs. Belgium's federal household is not finalized yet. For several matters, there remains ambiguity about which authority is organizationally and financially responsible. It is expected that the division of competences among the federal and the regional level will continue to evolve and so will probably the RSDIs and NSDI.

(-) From the national and European perspective, the regional approach to SDI in Belgium adds to the complexity since the three initiatives are only weakly coordinated among them. Since the Brussels region is completely urbanized, it is developing a particular 'urban SDI'. The result is that Belgium is not fully covered by equivalent SDI.

7.3.2 France

For the interviewed French SDI-stakeholders, 'success' has several dimensions. Some highlight the important financial savings on data acquisition and the efficiency gains which the partners of a user-driven SDI can make. Efficiency is also gained by contractors performing works or studies for the public sector. SDIs are said to contribute to data quality due to interaction with a larger user base. The environmental sector points to the prevention of environmental damage and of related reclamation costs as being a major (potential) benefit of operational SDIs. Also the possibility to involve citizens and NGO's more closely in the environmental policies and actions have

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[3] In its turn FÖMI is depending entirely on the MoARD

been mentioned. In addition, GI is used by groups who would not do so in the absence of SDIs (students, schools, hikers, ..). The current trend in France for more SDI-initiatives to take off leads to more intensive use of data and to the development of a real market for the solutions and service providers.

(+) The confirmed presence of a national lobbying body for bringing stakeholders together and initiating legal and other initiatives clearly is a strong point.

(-) The absence of political support for a French NSDI.

(-) The French territory seems to be too large and the competences for territorial matters too decentralised for one nation-wide SDI-initiative to be successful. For the public sector, regional and maybe thematic SDIs seem to be more appropriate to respond to user needs.

(-) The fact that the major data provider has a firm mandate to produce nation-wide reference geodatasets according to uniform specifications, is being perceived as a bottle neck. The lack of data user involvement in the steering of the data production is perceived as a weak point.

(-) Another difficult point for the RSDI and TSDI is the difficulty to obtain spatial data under flexible use and copyright conditions. From the point of the data producers, the firm introduction of the cost-recovery principle in the agencies producing the major nation-wide datasets, is counter-productive for development and interconnection of true general-purpose and thematic SDIs.

7.3.3 The Netherlands

From the organizational and technical point of view, the Dutch NSDI certainly presents a success story. For many of the (potential) data users at the lower administrative levels and in the private sector, the success is more relative due to the limited affordability of the offered data.

(+) The high degree of operationality of the Dutch NSDI is attributed to its early start, the coordination by a broad platform of stakeholders and its relatively limited scope. Only fundamental datasets, produced by several data producers, of the very large scale are involved.

(+/-) The Dutch model of negotiating solutions between all involved stakeholders leads to sustainable solutions for items having general support but is time-consuming and even prohibitive for issues where consensus is not easy to reach. This provides one of the explanations for the limited data scope of the NSDI.

(-) The weak points relate to financial aspects. The de-regulation in the GI-sector (e.g. (semi-privatisation of the Cadastre and the National Mapping Agency (Topografische Dienst), Public-Private Partnerships for the production of the large scale base map, …) has led to the firm introduction of the cost-recovery principle in those agencies, making the free flow of the GI they produce in all levels of administration, almost impossible, given current policy.

(-) Some stakeholders point to the absence of a formal NSDI-coordinating agency as a weak point.

(-) The self-consciousness of local and regional governments and the culture of relative autonomy is a strong point in its relationship with the citizen but is another barrier for smooth further development of the NSDI.

(-) One centralized metadata service does not seem to function properly. Like for data, metadata should be kept with and maintained by the data producer from where it should be accessible through a central point of entry and providing access to the data.

(-) the active involvement of a private company in a public sector oriented SDI leads to some distrust, even though no public body was willing to assume responsibility for the metadata service.

7.3.4 Switzerland

(+) The highly decentralised political structure of Switzerland requires the adoption of original solutions where the equilibrium between local, cantonal initiative and federal coordination is maintained.

(+) One strong point of the NSDI is that it focuses on standardization and provides and maintains guidelines and a toolset (INTERLIS) for documenting, modeling and exchanging GI.

(-) Barriers are most obviously price and use restrictions. The NSDI will probably succeed in opening up the potential in the private GI market place if it is able to assure the business community that data will become more accessible, that the market place will become more open to free competition and that the innovation spirit will not be compromised through excessive restrictions.

(-) There are very many relevant GI-based applications and services found throughout the extremely decentralised public sector. To become fully operational, all these –often stand-alone- initiatives should be interconnected and this seems to be an almost impossible task.

7.3.5 Germany

(+) Also the German state structure is highly federal. The subtle NSDI-approach in which responsibilities for data production and mutual coordination are kept with the Länder whereas the federal data users and producers organize themselves and interact with the regional data producers to ensure interoperability, accessibility, … is perceived as a factor for success.

(+) Political support has been and still is very important for the development of the SDI. SDI issues have been discussed over the years in the Bundestag, the German parliament while several legal initiatives were taken.

(+) The Umwelt Data Katalog which is operational since 1992 is used by many different stakeholders throughout Germany. It proves that users of GI need this type of service. As a result the initiative was taken to develop a broader metadata catalogue, a metadata service, the GeoMIS.Bund and a general portal, the GeoPortal.Bund.

(+) The availability of harmonized reference data for the whole country is a strong point.

(-) The federal structure has a lot of advantages, but makes the organization of the NSDI not simpler. A lot of coordination between de different stakeholders is necessary.

(-) There is a lack of recognition for the importance of sustained funding for the basic elements of the NSDIl. The functioning of the geodetic framework as part of the European and international networks is often seen as 'normal' and not enough as integral part of the NSDI (and ESDI).

7.3.6 Finland

'Success' is described of added value: better agricultural, environmental and planning policy. Also development of new markets, new services for the citizen are mentioned.

(+) A positive fact is that the Finnish NSDI-initiative succeeded in attracting the attention of a number of private organizations because it would support their own interests.

(+/-) The ongoing NSDI design and development process helps the regional councils and regional associations to better communicate with the Association of Finnish Local and Regional Authorities. This eventually leads to more harmonisation, standardisation and interoperability.

(-) Finland's NSDI is to a large extent based on gentlemen's agreements while it is recognised that these are not always efficient. The need to 'enforce' enhanced cooperation is one of the foreseen challenges.

(-) Limited funding is perceived as the second major barrier.

7.3.7 Hungary

(+) A perceived factor for success of the Hungarian NSDI-project is the fact the Hungarian stakeholders are also involved in the active preparation of the accession to the European Union (several European GI oriented projects and programs are under development) based on the National Programme for the Adoption of the Acquis Communautaire.

(+) Political support to the NSDI-initiative is recognized to be a strong point.

(+) There is a general agreement among all stakeholders (local, regional and national authorities, private sector) that the development of reference data (cadastral data in particular) must have the highest priority. This is confirmed by legislation. legislation

(-) It was said by several stakeholders that data are very (too) expensive. At the same time, everyone agreed that high quality and up-to-date geographical reference and core thematic database needs a lot of investment.

(-) The incomplete metadata initiative is considered to be a weak point in a relatively successful SDI.

(-) The role of the various stakeholders needs to be better defined.

(-) For the local level, at this time the lack of access to the Internet is a problem.

7.3.8 United Kingdom

Success is expressed in terms of gains of efficiency, facilitation of e-government, modernisation of governmental services and the establishment of closer links with the citizen.

(+) The market-oriented approach to a NSDI is generally supported as leading to success.

(+) The awareness raising and the performance of concrete NSDI-projects by the cross-sectoral and mixed public-private body AGI plays is generally supported.

(-/+) There are multiple tensions between government and commerce regarding the rules of the GI-market place. Some describe them as being healthy. Others point to the negative implications for the NSDI. Especailly the discussion about commercialization of PSI attracts the attention. The evolution of government organizations to Trading Funds is said to be worrying as commercial and public service operations are being mixed. One effect would be that the price-setting of datasets by public PSI-providers is not always realistic (as cost-based calculation is being used instead of value-based pricing). Doubts exist about the clarity and consistency in which PSI is treated. The Treasury aims to make the NDP commercially-oriented and profitable enterprises, while the Cabinet Office wants to deliver map-based information services to the citizen, free at the point of delivery. Agencies with trading funds (NMA, Land Registry, Hydrographic Office) are said to come into straight competition with the private companies.

(-) The major barriers relate to financial and legal aspects. The Crown copyright system is unique in Europe and complicates the sharing, re-use and trading of GI.

7.3.9 Italy

(+) The Italian NSDI is based both on existing old establishing the mandate for the collection of GI assigned to 5 different Public Services and on a new foundation the "Intesa-Stato Regioni" to better address the increased decentralisation. The agreement signed in 1996 by various Ministries and the Italian Regions made possible to access a huge amount of data collected at regional/local level and to proceed to standardise and harmonise the content through the adoption of recently published common specifications.

(+) In order to start to provide GI-services, a National Portal has been developed federating all data providers at various levels. In addition as part to the agreement "Intesa Stato-Regioni" a specific budget was assigned not only to write common specifications but also to create/harmonise a number of "strategic" reference layers at

scale 10.000 (hydrography, roads,..) through generalisation of information already available at regional level. As a consequence it is possible now to have access to a limited number of harmonised layers.

(+) e-Government is playing an important role in the modernisation of the Italian Public Administration and it is not surprising that one of the best e-government projects is the GI Dissemination Service of the Province of Bozen. Other big e-Government projects can contribute significantly to improve interoperability of GI and GIS.

(+) For new data production common technical specifications have been agreed. This will permit to collect new data of comparable quality in the near future.

(-) The Intesa Stato-Regioni is an agreement, not a law. The only related Italian law is still making reference to the old structure of the Italian Public Services. An amendment of the law is necessary (in order to formalise what has been established by the Intesa). Also there should be the formal obligation for data producers to make available (publish) the data through the National Portal. It should be noticed however that some Regions have been or are in the process of publishing Regional laws to formalise activities related to the creation of RSDI.

(-) The benefits of the IntesaGIS is clear but the financial issue remains of course important, both to guarantee the maintenance/updating of the existing datasets and to continue the process of harmonisation on other important layers.

(-) For data at medium and small scales the situation seems less encouraging because the National Military Agencies are not planning an overall update of the maps and geodatasts but are giving priority to more "politically sensitive" areas.

(-) The link with users, including agencies working at local level still is sub-optimal.

7.4 Further development of (N)SDIs under INSPIRE

7.4.1 Belgium

The RSDIs of Wallonia and Flanders are developed in close agreement with the INSPIRE vision and principles. One of the driving forces for the recent RSDI-project in the Walloon region was indeed the fact that INSPIRE's vision could be built upon.

In a no INSPIRE scenario, the Flemish and Walloon regional SDIs will most probably continue to evolve towards an INSPIRE-like system. In this respect, INSPIRE has already reached one of its goals, i.e. formulating and promoting generally accepted objectives for an SDI. The added value of INSPIRE clearly is speeding up this process and harmonizing it into a EU context. Without INSPIRE, the Brussels SDI will over the next years probably stick to its core business: producing and disseminating a digital base map for urban applications. No real vision for the setting up a multi-component RSDI is in place.

It is clear that in a federal structure as in Belgium, EU-guidance will be beneficial for interregional dialogue on compatibility and interoperability. If INSPIRE would require the designation in each member state of a central point of contact, then the federal NMA would definitely be a candidate for Belgium as a whole.

7.4.2 France

Despite the absence of a NSDI, the national data producers keep an important position in meeting the data requirements for the European level.

In a 'no INSPIRE scenario', the evolution of SDIs in France will most probably continue to be heterogeneous leading on the one hand to strong initiatives but on the other hand also to geographic regions and thematic domains for which SDIs will be underdeveloped or even completely lacking.

Following items have been mentioned as being the expected added value of the implementation of INSPIRE:

- Clarification and stabilization of concepts, e.g. with respect to critical resolutions;

- Ensuring that the information flow is optimised and that author's rights do not compromise this flow;
- Facilitation of the connection between the various RSDIs, LSDIs and TSDIs through standardization;
- Enable transnational issues to be tackled.

7.4.3 The Netherlands

In a 'no INSPIRE scenario, the Dutch NSDI will most probably continue to evolve towards an Inspire like system as driven by recently formulated visions (Space for Geo-information and foundation NCGI). The added value of Inspire clearly is with speeding up this process and integrating it in a EU-context.

Inspire's policy principles are applicable to the NSDI and lower level SDIs in NL but efforts and costs to impose rules for standardization, data sharing are not to be underestimated.

7.4.4 Switzerland

The approach adopted by COGIS when developing the strategy and implementation plan of the Swiss NSDI appears to be in agreement with INSPIRE, and clearly adheres to a number of key principles including the use of standards for documenting, modeling and exchanging GI, ensuring that basic GI is available and managed at the appropriate levels, defining minimum requirements for metadata and ensuring these metadata are made available. Implementation of INSPIRE will be beneficial for consolidation of this approach.

The most important socio-economic benefits that are expected via an operational Swiss NSDI are the increase of activities in the value-added area of GI. The increased activity is expected to yield significant improvements in the GI market.

7.4.5 Germany

There is a general agreement on the importance of INSPIRE and a European SDI, as well as on the need to develop further the German SDI as part of the ESDI. However, there are some great 'concerns' regarding the application and further development of the INSPIRE initiative:

- It was underlined by several stakeholders that INSPIRE should not result in additional rules and directives. It should be avoided that new databases must be developed. INSPIRE should focus on linking existing initiatives and products.
- It was also indicated that not too much effort should be put on the harmonization of databases. The soil database was given as an example where a harmonization of the classification scheme at European level is said not being very useful, although very costly.

It was said by several stakeholders that the INSPIRE initiative is helping to better coordinate the activities and to further develop the German SDI. INSPIRE is expected to give the standards and tools to tackle in an easier way cross-border applications which are becoming more and more important (e.g. to monitor flooding in a cross-border region). It is expected that there will be a streamlining of the pricing policy.

It is emphasised that the implementation of the INSPIRE measures will be more complex in a decentralized environment, where a lot of stakeholders play an essential role, than in more centralized initiatives. At the same time it should be said that all stakeholders are very willing to implement the INSPIRE principles.

7.4.6 Finland

The new strategy document by the Federal Council for GI, available June 2003, defines the NSDI using INSPIRE ideas, clearly going beyond the earlier concept document from 1995.

The success of the INSPIRE programme is seen to be important to the future development of the Finnish NSDI. A 'no INSPIRE scenario' will lead to important delays for improvement of the GI-provision. Nevertheless, a key aspect to the Finish attitude towards INSPIRE is to not be too dependent on INSPIRE.

INSPIRE might offer a political leverage useful to developing the Finnish NSDI. In any event INSPIRE will bring increased awareness of using GI.

7.4.7 Hungary

The INSPIRE initiative is believed to enforce all the Hungarian stakeholders to think and work in a more uniform way. This will be of benefit not only to the European level, but also to the national level. Hungarian initiatives will be able to refer to INSPIRE legislation and standards for their proper work.

It is also expected by some stakeholders that INSPIRE will make data more (and more cheaply) available for the end users. It is also said that there is a need and potential for more cross-border applications, as was shown and already done to a certain extent in projects with Germany, Austria and Romania. Some areas of application seem to arise with this regard, e.g. the flooding problems – disaster management.

There is a general agreement on the importance of INSPIRE and a European SDI, as well as on the need to develop further the Hungarian SDI as part of the ESDI. This became very clear during the interviews: out of the 20 stakeholders, there was not one that was questioning the INSPIRE nor the HU-SDI initiative.

The main difficulties to implement the INSPIRE principles are related to the financial aspects, especially with respect to the availability of geodatasets.

7.4.8 United Kingdom

INSPIRE has given space to (high) expectations for solving issues of standardisation, harmonisation, commercialisation of PSI, copyright issues…A 'no INSPIRE scenario', might have negative consequences for any future cooperation for European GI-projects as many GI-players have taken up a lot of effort to participate and cooperate.

The UK government supports in principle the overall aspirations of INSPIRE, recognising the benefit of quality interoperable information to support policy at all levels of government. It is stated that also without INSPIRE, the GI-situation in the UK is moving into that direction. The GI-strategies that are being set-up in the UK are indeed INSPIRE-oriented. This is the more evident for the GI-strategy of Northern Ireland, which is the only part of the UK with land bordering another EU Member State. The private sector agrees with the INSPIRE vision and policy principles.

However, it is clear that current position and policy on PSI and GI in the UK (e.g. the Crown copyright and Trading Fund systems) complicate the implementation of INSPIRE.

7.4.9 Italy

The approach adopted through the "Intesa-Stato Regioni" by the Ministry of Environment to give access to existing information in an increasingly decentralised political and administrative setting, appears to be in agreement with INSPIRE. It clearly adheres to a number of key principles including: the use of standards for documenting, modeling and exchanging GI, ensuring that basic GI is available and managed at the appropriate levels. Some improvement is needed to better conform to international standards. There are plans to move to OpenSource software and to increase interoperability.

In a 'no INSPIRE' scenario the main problem will concern the licensing framework and the lack of obligation to make data accessible. The Intesa that has been signed by the Regions and several Ministries is not imposing the obligation to make data accessible. Its scope is limited to develop and better coordinate common specifications and the production of some harmonized information layers.

Users are still not adequately involved. The Private sector expects that INSPIRE will make possible the development of new e-Commerce services based on "more accessible" geographic information. Also the local level is currently not addressed and very few examples exist of INSPIRE compliant services at the level of local municipality.

The INSPIRE-framework will contribute to the removal of possible conflicts/misunderstanding between regional Authorities and National Services if it caters for the clarification of roles and of the responsibilities of data custodians.

Some INSPIRE data are not collected and/or maintained. A INSPIRE framework is needed to cover the existing data gaps.

8. RECOMMENDATIONS FOR THE IMPLEMENTATION OF INSPIRE

8.1 General

Due to the complex implications of the INSPIRE-vision and the relatively little advanced and heterogeneous state of NSDIs and other SDIs in many countries and regions, a step-by-step approach to reaching the INSPIRE-objectives is imperative. Available experience still needs to be consolidated and the learning curve is still steep. A stepwise approach will enable to take into account further evolutions in countries, while in the mean time guidelines and standards can progressively be set. The fact that the INSPIRE legislation will probably be a framework legislation, allowing for technical and other amendments as time moves on, fits in this concept.

A continuous point of attention for INSPIRE is to continue to build on the outcomes of the working groups to ensure adherence of the initial stakeholders to the initiative. This also means that INSPIRE should keep focusing on awareness and clarification and stabilisation of concepts. By further monitoring the state of play of SDIs and the implementation of INSPIRE, the effect of this awareness raising can be assessed and corrections implemented if needed. Projects aiming at the connection between various RSDIs, LSDIs and TSDIs through standardization should be supported.

INSPIRE should stick as closely as possible to the proposed timing. Whereas in many instances the INSPIRE-discussion has positively contributed to the formulation and implementation of NSDI-strategies and projects, we have come to a point where expectations for INSPIRE are such that national and other initiatives are delayed in order to obtain maximal benefit from INSPIRE and contribute in significant ways to the ESDI.

8.2 With respect to legal issues

As a general principle, INSPIRE should recognise subsidiarity and the need for proportionality. Legal requirements must be the minimum to achieve the desired result. INSPIRE should be complementary with existing and expected EU law. Overlaps and potential conflicts must be avoided.

8.2.1 Build upon subsidiarity but do involve regional and local levels

Since INSPIRE is a European initiative, it is only logical that the starting impulses for the development of a framework for the sharing and trading of geographic data are given on the European level. Several working groups have occupied themselves with different aspects of the framework, involving varied interested parties in the process. However, attention must be given to the importance of acceptance and participation of the regional and local level. As a very large part of the spatial data involved in INSPIRE will be collected and maintained on their level, the regional and local administrations are key players in the implementation process. Both their actual participation and their subjective sense of being consulted have to be ensured.

8.2.2 Build upon and ensure complementarity with related legal initiatives (PSI). "Two sides of the same coin ?"

While INSPIRE is mainly concerned with the availability of spatial data for the formulation, implementation, monitoring and evaluation of Community policy and access of the citizen to spatial information, the first priority of the draft directive on re-use of public sector information is the re-use by the private sector in general and the information industry in particular. Treating the two initiatives in isolation would lead to a sterile distinction between two issues that are intrinsically linked, as in the end, the same information will be needed by the citizens, by private sector market players and by the public sector bodies. In some cases, the public sector bodies will use spatial data to create value-added information products and services themselves, and will hence have to comply with the same rules as their private sector competitors.

We recommend to consider GI as a special type of PSI, requiring special attention. This means that the INSPIRE legislation is coordinated with the PSI-directive and that complementarity between both texts is stressed.

8.2.3 Ensure compliance with the data protection directive

Reference and core thematic spatial data per se are not hazardous to the individual's privacy. However, through the combination of such large scale data with spatial and non-spatial data outside the scope of INSPIRE, more information may be revealed about a person than initially intended. This can entail reluctance of governments, administrations and citizens towards the dissemination of the spatial data targeted by INSPIRE, due to a qualification as 'personal data' under Directive 95/46 on the processing of personal data. To avoid the curtailing of the potential benefits of combining (spatial) data, compliance with the rules of this Directive must be ensured. Special attention should be given to a harmonized interpretation of the terms and conditions for the processing of personal data in the Member States, referring explicitly to the spatial dimension.

The concern should be that the justified citizen's sense of privacy should not lead to the non-availability of much needed information for administrations and other users to perform their public tasks.

8.2.4 Author's rights and copyright

Author's rights and copyright in frequent cases compromise the optimal use of GI. The UK Crown copyright system is an example of the complication copyright legislation can have for the sharing, re-use and trading of GI. INSPIRE clearly presents an opportunity to formulate rules in this respect, taking into account related legislation.

8.2.5 Compliance with competition law

A considerable part of the INSPIRE activities will include involvement of the private sector. In their relationship to the private sector, the administrations will have to make sure that the rules of European competition law are obeyed. When it comes to INSPIRE spatial data, two situations come to mind.

On the one hand, administrations will disseminate spatial data to the private sector, which will use these as a resource for the development of value added information products and services. The administrations will have to make sure that spatial data are made available in a transparent and non-exclusive manner and apply the same charges and the same conditions to the same categories of users (in line with what we have stated above, this would also coordinate INSPIRE efforts with the draft directive on re-use). The development of a standard license agreement, comparable to licenses that already exist in some Member States, e.g. the United Kingdom, will enhance transparency and facilitate the dissemination of INSPIRE data to the private sector.

On the other hand, the administrations can offer value-added information on a commercial basis. In this case, they will enter the market and most likely perform economic activities, which entails that competition with the private sector has to be fair.

Again we can refer to the draft directive on re-use, which states that public sector bodies disseminating value-added information products will have to obtain their resource data at the same prices and conditions as their private sector competitors.

8.3 With respect to organizational issues

8.3.1 Promote the creation of GI-associations

In line with the subsidiarity principle, the EU will require a focal point in each country to administer and make work the INSPIRE legislation. Although it clearly is the responsibility of the Member States and other countries subscribing to INSPIRE to designate a point of contact, we have identified for each country a possible one, i.e. the official or de facto coordinator of the NSDI or, in the absence of such an NSDI, one which seems to be a strong candidate for a future NSDI. It is clear however that for some countries where an organization of the NDP-type is the leading agency, the data users are insufficiently present in the SDI-framework. National GI-associations can fill this gap.

8.3.2 Promote the creation of thematic centres of excellence

In order to further develop the use of GI in the framework of operational SDIs, it will be beneficial that different stakeholders work together to apply and test INSPIRE principles to solve real world problems. This should not be new organisations, but existing ones as is already done in Germany. This type of thematic centres could also develop and/or support cross-border initiatives.

8.4 With respect to reference data and core thematic data

8.4.1 Clear priorities for data content

INSPIRE should reflect the stated and delineated needs of policy and other users of easier access to international, national and sub-national data. This can mean that for some of the selected data themes it should not aspire to be fully comprehensive in terms of geographical coverage. This may be the case data themes relevant for e.g. coastal zone policy.

INSPIRE should clearly reflect on the priority character of the data themes. Instead of working with 2 or 3 priority settings for the data packages, 4 or 5 with related deadlines may be more appropriate. This does not necessarily mean that the data scope for INSPIRE should be reduced but it is important to bring as many data producers on board as possible.

A question frequently raised is whether INSPIRE should deal with spatial data of very high resolution, e.g. buildings, and whether this data theme should not be left to national coordination. This statement is counterbalanced by the need for (agricultural) parcel data at EU-level. Also in other EU-programmes there is a need for the most detailed information (e.g. NATURA 2000, TEN-policy).

8.4.2 Liaise with other major EU-initiatives in the spatial domain

Other major European initiatives deal with spatial data production and update (e.g. GMES, Galileo). Synergy between those initiatives and INSPIRE must be exploited. This means that INSPIRE-specifications should be included in the work programmes for e.g. GMES and that the datasets coming out of GMES should be documented and made available through the INSPIRE-channels like the geo-portal (see 8.5.2).

It is also recommended that INSPIRE be clearly present in the Sixth and next EU-framework programmes for Research and Technological Development. Many of the Integrated Projects and Networks of Excellence under these Programmes deal with spatial issues at pan-European and other levels. Both the sustainability of the results of such programmes and the impact of INSPIRE will benefit from the integration.

8.5 With respect to Metadata

8.5.1 Incremental approach to metadata production

We recommend to proceed along the line of a distinction between discovery, exploration and exploitation metadata. Although metadata and metadata access services are probably the most fundamental component of the ESDI, the heterogeneous metadata culture in the various countries almost forces INSPIRE to a step-by-step approach. The creation of discovery metadata catalogues and web-based access services would then be the recommended first step.

8.5.2 Common European thesauri

General purpose and thematic multi-lingual thesauri are essential for enabling seamless search operations on multiple metadata catalogues, for better understanding of the search results and related geodatasets and for making use of other distributed GI-services. There is a need to inventory and assess existing thesauri, assess the potential for integration, cross-referencing and translation and maybe, come up with adapted thesauri.

8.5.3 Promote the assignment of national coordinators for metadata production and maintenance

In many countries metadata are produced for (parts of the) reference, core thematic and other thematic data on a rather voluntary basis. No authority is overviewing nor coordinating the metadata production, maintenance and dissemination. Since for INSPIRE, availability of metadata and discovery services clearly is the first condition to be met for taking off, we recommend to pay particular attention to this issue. In Germany, Belgium, Portugal such coordination is already in place.

8.6 With respect to access services

A EU-geoportal federating progressively the more mature national access services to metadata and data is definitely a good initiative. It should be considered as a pilot project in which selected and targeted user groups are to be involved to asses the added value and shortcomings of the approach for helping in removing barriers and promoting the use of GI in transnational context.

8.7 With respect to standardisation

The ongoing and important efforts for standardization in the GI-domain show that we deal with complex issues. SDI-stakeholders call for the avoidance of imposing heavy technological obligations. There is probably scope to derive simplified profiles from some of the ISO and other standards and propose these as INSPIRE standards. This is already common practice in some countries (e.g. Norway). The Dublin core metadata profile provides another example.

There is an urgent need to address the migration of existing metadata and metadata systems to a common standard. Since at this moment no final ISO-metadata profiles are available, a transitional solution should be proposed.

8.8 With respect to funding

From the perspective of the EC as a user of pan-European spatial data, the success of INSPIRE is heavily dependent upon the progress made by the EU-member states and other participating countries in developing their NSDI. Even if the subsidiarity principle has to come into play, INSPIRE should foresee sustainable channels for (co-)funding of national and lower level projects and not impose disproportionate funding requirements on Member States. In section 8.4.2, liaison with the EU R&D programmes and other major initiatives in the spatial domain is recommended for making the data content of INSPIRE progress. These programmes and projects are also obvious channels to provide financial support to transnational and EU-wide INSPIRE-oriented initiatives.

From the current driving forces for the establishment of NSDIs, i.e. the modernization of government, modernization of NDP, creation or modernisation of cadastres, programmes related to the promotion of e-government and information society, shortcomings in disaster prevention and management and the need to enhance and make more cost-efficient administrations, the e-government issue is probably the most appealing and already by now an important source of funding for NSDIs. Further exploitation of this and other synergies should be encouraged to contribute to a sustainable funding of the building blocks of the NSDIs and ESDI.

We recommend that the EC attributes dedicated funds to support existing and new transnational pilot projects and include in the terms of reference that results have to be made available in an SDI-fashion and through the EU-geoportal.

It is also advised that at EC-level every GI related project is assessed on INSPIRE compatibility. Several key action areas will need specific attention with this regard in the near future: the water framework directive, issues related to flooding, forest fires monitoring, nature protection, TEN policy, control of agricultural subsidies, etc.

9. ACKNOWLEDGMENTS

For the compilation of this summary report on the state of play spring 2003 of (N)SDIs in Europe and of the related country reports, the authors have been able to rely on formal and less formal inputs from various persons and organizations, whom are gratefully acknowledged. To name but a few:

- The EC-officials from Eurostat, DGEnv and JRC, guiding this study;

- All experts who have provided correcting and completing remarks to the country reports. Their names are mentioned in the meta-information section of each report;

- All SDI-stakeholders whom we have interviewed during the 9 country visits, for their time, vision and ideas and for the feedback they provided to the minutes of the interviews. Their names are listed in the minute documents;

- Many of the participants to the INSPIRE-expert meetings, who during and after the meetings have provided valuable suggestions and information of conception and completion of this report.

10. ANNEXES

10.1 Further monitoring of the State-of-Play of SDIs in Europe

The information about the NSDIs which has been gathered in Activities 1 and 2 of the State-of-Play study is essentially of a descriptive nature. It has been compiled in country reports and summarized in the present report. The origin of the information is (1) the consultation of web sites and readily available publications, (2) comments solicited from national GI- and SDI-experts and (3) information and comments received during on-site visits and face-to-face interviews in 9 of the 32 countries.

Since the state of SDIs, SDI-components and SDI-building blocks is inherently dynamic and since the INSPIRE initiative is to be built upon these dynamic elements and at the same time aims at streamlining their dynamics, it is useful to continue monitoring the SDIs (see also recommendation # 8.1).

In order to allow for such monitoring and update for the next two years with an available manpower of 1 person-month per year, we propose to work along following lines:

- A (directory of an) internet site, hosted by the EC or the contractor, is devoted to this monitoring and update mechanism;

- The 32 country reports are brought online as HTML-documents which allow to easily navigate from the table of contents of the document to every concerned section;

- Also an explanatory document for the expected content of each of the headings in the country reports is made available together with a blank report template;

- Every organization or individual is entitled to use the available tools and provide input (with references) to the contractor using the blank report template through e-mail. The only condition for repliers is full identification;

- At the end of the year, the contractor processes the collected information into addenda to each country report;

- The possibility to provide such updates is advertised through the INSPIRE-communication channels.

In the mean time, the contractor keeps on monitoring the content of SDI-related websites for updates and corrections and integrates these in the report addenda.

Based on the updated country reports, the summary overview of the state-of-play of SDIs in the 32 countries (Section 7.1) and the typology (Section 7.2) is updated. A revision of the typology to better reveal the operational changes of the SDIs may be necessary. More precise criteria for evaluating whether a country is changing from one class (e.g. not operational) to another (e.g. partially operational) need to be defined.

The changes are highlighted in a concise 'change-only' report.

10.2 Regular country reports

The 32 country reports are separate documents available in printed form, as .DOC or .PDF-files. The naming convention for the digital documents is the following:

rcrCOUNTRYCODEvx.doc or rcrCOUNTRYCODEvx.pdf

with

- rcr standing for 'regular country report'
- vx standing for the version number, e.g. v4
- COUNTRY CODE as in Table 4.

10.3 Dedicated country reports

The nine dedicated country reports are separate documents available as printed documents, .DOC or .PDF-files. The naming convention for the digital documens is the following:

dcrCOUNTRYCODEvx.doc or dcrCOUNTRYCODEvx.pdf

with

- dcr standing for 'dedicated country report'
- vx standing for the version number, e.g. v4

10.4 Comparative report for Australia, Canada and the United States of America

The .DOC or .PDF version of this document is named: rpAUCAUSvx.

EU-15	
AT	Austria
BE	Belgium
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GR	Greece
IE	Ireland
IT	Italy
LU	Luxembourg
NL	The Netherlands
PT	Portugal
SE	Sweden
UK	United Kingdom
Accession Countries	
CY	Cyprus
CZ	Czech Republic
EE	Estonia
HU	Hungary
LT	Lithuania
LV	Latvia
MT	Malta
PL	Poland
SI	Slovenia
SK	Slovak Republic
Candidate Countries	
BG	Bulgaria
RO	Romania
TK	Turkey
EFTA countries	
CH	Switzerland
IS	Iceland
LI	Liechtenstein
NO	Norway
Non-European countries	
AU	Australia
CA	Canada
US	United States of America

Table 4: Acronyms for countries