UNITED NATIONS   **E/CONF.100/IP.8**

ECONOMIC AND SOCIAL COUNCIL

Eighteenth United Nations Regional Cartographic
Conference for Asia and the Pacific
Bangkok, 26-29 October 2009
Item 7(b) of the provisional agenda
Invited Papers

Spatially Enabling E-Government through Geo-Services[*]

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Spatially enabling *e-go*vernment through geo-services

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Acronyms mostly used:
EU European Union - **EC** European Commission - **ESDI** European Spatial Data Infrastructure - **e-SDInet+** European project under e-contentplus programme - **EUROGI** EUROpean umbrella organisation for Geographic Information - **GI** Geographic Information - **GIS** Geographic Information System(s) - **INSPIRE** Infrastructure for Spatial Information in Europe - **MS** Member State – **NGO** Non Governmental Organization - **PA** Public Administration - **SDI** Spatial Data Infrastructure .

Foreword

The present document refers to the paper already presented at the *9th Ninth United Nations Regional Cartographic Conference for the Americas,* New York, 10 - 14 August 2009 and it continues the discussion of how to integrate *e-gov*ernment and geographic information for providing the most efficient services to the inhabitants in various spatial and temporal situations.
The paper summarizes some of the actions already developed at European Union level considering the national and sub-national initiatives. The paper discusses the e-SDInet+ project focusing on some practical aspects and briefly addresses some theoretical issues. Moreover and on the side some basic information about European policies related to GI are summarized in order to build and to share a common basis of knowledge.

e-government and geo-services

The *geo*-government (*geo-gov*) is the ability of public authorities to use geo information for managing, controlling, planning human activities and the nature of the territory. *Geo-gov* concretizes if the geo-information is bundled within the public administration initiatives in a way that the final user (generally the inhabitant but it might also be the environment and the wildlife) gets fully recognized advantages which may not be achieved without using geo-information and SDI .
Geo-gov practices use and orchestrate web services which use GI , so called geo web services, and traditional web services and/or software programs for treating and delivering the results to the final users.
Since the beginning the *e*-government services have been developed and widely used mainly in nations where they may be economically and socially sustainable. In countries and/or situations where primary needs are not fully satisfied both the *e-gov* and the GI may easily appear as deep divide. This situation implies the application of the axiom, frequently used , no cartography = no development. According to this and in order to build the development many resources are invested to build cartography and data base which, against the previous axiom, are difficult to be used the local population for his benefits. The lack of available technology, the disconnection from the real local needs and not easy understandable differences of representing the reality are the principal reasons of not making GI usable and useful for so called developing communities.
It has been largely demonstrated that GI is in the knowledge and in the population's

memories. Because this the action of giving benefits through the GI should be reversed insuring how to provide useful services to population extracting information from their knowledge and use of the territory.

Some considerations about how to provide services is also necessary. Not only the www should be considered as the unique system for providing information and services but some other (telephone, radio, TV, door to door , etc.) systems should be considered. Some of them are suitable in emergency management and some others already demonstrate their efficiency providing real geo-based services to population in very much less favored areas.

According to the previous assumptions the SDI becomes a more complex system efficiently attuned to real information previously derived from the inhabitants, aiming to provide useful and sustainable services.

In my opinion, in order to maximise the effectiveness of the results, our attention has to be turned to Spatial Data Infrastructures as a comprehensive system which satisfies the need of the users (citizens, inhabitants) to be placed at the centre of the scene. The spatial component of data in the infrastructures has always been present but sometimes it was hidden and/or bundled in the data and information collected and stored in systems and or simply provided to decision making process. Therefore the real strength of the DI (Data Infrastructures) has been and is still based, in the majority of situations, on the infrastructure itself.

This inhibits the advantages of using the geographic data in the services provided to the citizens. Therefore in the most common situations at worldwide level the public administrations are focussing more on the development of infrastructure than on its produced results.

This implies that very much effort is used, specially in developing countries, for transferring models and infrastructures already developed in more wealth situations and societies. This does not contribute to eliminate the divide unless the sustainability is insured and the real needs of population are clearly placed at the centre of universe of SDI discourse.

What does an infrastructure represent for the public administration in the concrete dominion? In physical terms the infrastructure goes from the premises hosting employees, visitors and archives to the roads and paths, cables and networks allowing the circulation of papers , forms, certificates and information .In the intangible dominion the infrastructure is represented as the set of rules , procedures , specifications , data and information which govern the production, the distribution and the usage of the services and the functioning of the infrastructure itself. Building SDI the public administrations often privilege the more tangible and industrial aspects.

The paradigm of paying attention to IT aspects of the infrastructure needs to be changed for the benefit of the final users which demand results and services on time and where they need.

This is absolutely demonstrated by the fact that the geo-services offered and/or supported by SDI are used locally by end users that have their own identity reflected in the services requested and that the *geo-gov* as a whole policy acts locally as already experienced by the *e-gov.* The approach of providing services where they are requested and for the direct users helps to reduce the digital divide and *de-facto* facilitates social and economic development.

Nowadays the way in which, Europe acts shows some very interesting peculiarities in the sense that it individuates one Directive (see paragraph below) for removing inefficiencies and improving value and quality in the provision, sharing and use of GI.

To let collaborate together National SDIs developed by the Member States under the aegis of a common agreed Directive and then to proceed through implementing technical rules and common data models it seems the most effective way for maximizing the results respecting the identities and the peculiarities of each nation and his territory.

The Directive does not deal with the realization of infrastructures but with their efficiency and sustainability. The Directive legal framework is aiming to let compose all data and services. The model is an equal opportunity model for all the data and providers and is based on subsidiarity model.

The strength and applicability of a subsidiarity model for developing SDI is largely demonstrated by the fact that it is applied in the majority of the European nations between the central and the local level (nation-regions , nation-provinces, region-provinces, etc.). The issue of relationships between central SDI and local SDI is becoming even more important in the political trend of devolution to local governments in the EU and represents foundations for collaboration with countries from other continents.

It should be clear also that the way of achieving social and economic development should be consistently based on academic education, research and training institutions able to produce not only GI specialists and GI users and products but also specialized professionals for designing and developing geo-services. On the other hand if these components are not all present it does not mean that a nation or a community might not have the chance to join to an SDI.

After some profitable years of investigation and technical and scientific findings mostly based on the axiom of interoperability it is now time to overturn the SDI praxis shifting the effort mainly of public administrations from the technology driver to the social and economic drivers in order to ensure the development of society by offering finalized and locally-based services based on GI and technological achievements. This may be achieved by a strict analysis of real user needs, an effective design process and investing adequate resources in the framework of capacity building of the users.

e-gov services , _geo-gov_ services and emergency management.

e-gov services need to be developed according to local community situation. The geo-services not only represent the natural evolution of the _e-gov_ services but they may also developed for managing specific emergencies occurring in the absence of adequate _e-gov_ services already in place.

The use of geo-services in disaster and emergency management is an effective example of GI relevance but other dominions such as agriculture, aquaculture and fisheries, forestry, settlements and others may be considered as application fields where the GI is absolutely mandatory and which may be adequately developed for delivering services to communities which are , are not or are on the way of using the _e-gov_ services.

It does mean that not necessarily the geo-services and SDI should be developed on the already existing _e-gov_ services infrastructure and that the data infrastructure of the _geo-gov_ services may be autonomously developed respecting the interoperability principles on which the data infrastructure practice is based.

European spatial data infrastructure : the challenge.

The meaning of Europe needs some explanations. The "European Union" (EU) refers to the current political association of 27 Member States (MS) which form an economic and political union. It should be openly recognized that in the EU the peculiarities and the diversity of historical, political and social aspects, which characterize each MS, generally divided into sub national areas with their own identity and power, make it very difficult to have a single European view of anything. Nevertheless it is possible to record a common attitude of the MS governments in treating specific aspects which have been addressed and agreed upon at EU level such as, in the specific dominion treated by this paper, the *e-gov*ernment, environmental issues and Geographic Information (GI) and other related techniques.

It is worth knowing that the EU acts with MS through Directives which after being approved by the EU Parliament must be transposed and implemented into each national legislation through a specific national act. Being in default of implementing EU directives may open infringement procedures on the part of the EU itself against the defaulting MS.

The European Commission (EC) (formally the Commission of the European Communities) is the executive branch of the European Union. The body is responsible for proposing legislation, implementing decisions, upholding the Union's treaties and the general day-to-day running of the Union.

The most relevant and recent directive regarding GI has been passed by the EU Parliament and came into force on 15 May 2007: it is named INSPIRE(Infrastructure for SPatial InfoRmation in EUROPE)[1]. The Directive sets a general framework for a Spatial Data Infrastructure (SDI) for environmental policies and for policies with clear impact on the environment. INSPIRE aims to improve the interoperability and the access to spatial information across the EU at local, regional, national and international level, to facilitate the sharing of GI between public authorities and the improvement of public access to spatial information.

INSPIRE is also complementary to related policy initiatives, such as the Directive on the re-use and commercial exploitation of Public Sector Information. INSPIRE is based on the premise that the European spatial data infrastructure shall be built upon the national infrastructures that have been established and operated by the MS. Five key principles have been highlighted since the signature of agreement among three Commissioners of the EU Government and they represent the pillars of the initiative which started more than five years ago and is nowadays consolidated into the Directive. 1. Spatial data have to be stored, made available and maintained at the most appropriate level. 2. It should be possible to combine spatial data from different sources across the community in a consistent way and share them among several users and applications. 3. It should be possible for spatial data collected at one level of public authority to be shared among other public authorities. 4. Spatial data are made available under conditions which do not unduly restrict their extensive use. 5. It should be easy to discover available spatial data, to evaluate their suitability for a given purpose and to know the conditions which apply to their use.

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[1]   http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2007:108:SOM:EN:HTML translation in all EU languages may be found at this reference.

These principles clearly address the ambitiousness of INSPIRE which intends to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services to the users. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an inter-operable way and for a variety of uses. The target users of INSPIRE include policy-makers, planners and managers at European, national and local level and the citizens and their organizations. Some examples of possible services are the visualization of information layers, the overlay of information from different sources, spatial and temporal analysis, etc.

The Directive has a key part in three annexes[2] which cover the priority data themes to which the Directive is addressed and they are covered by its daughter legislation which take the form of Implementing Rules (IR) for specific aspects.

At the moment these IR cover five major issues : Metadata , Interoperability of spatial data sets , Network services , Data and service sharing, Monitoring and reporting. They will become legally binding as a EU decision through a comitology process set up at EU level as part of the legislation.

The Directive transposition time expired in May 2009 but it has to be said that, in spite of the wide consensus and strong support that has been received since the initial phase from the majority off the scientific and technical communities and the public administrations, after two years from the date of entering into force only a minority of the MS have already ended the transposition phase. Nevertheless the adoption phase of the IR , which runs parallel to the transposition process, will last until 2012 with phased compliance between 2010 and 2012.

In spite of the delay in transposing the Directive into the national legislations, the Directive itself has influenced and is continuously influencing the sub national level of public authorities. This gives a multiplier factor to spatial information in many final user oriented services provided by central and local public authorities.

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ANNEX I - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(A), 8(1) AND 9(A) : 1. Coordinate reference systems ; 2. Geographical grid systems ; 3. Geographical names ; 4. Administrative units ; 5. Addresses ; 6. Cadastral parcels ;7. Transport networks ; 8. Hydrography ; 9. Protected sites .

ANNEX II - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(A), 8(1) AND 9(B) :

1. Elevation ; 2. Land cover ; 3. Orthoimagery ; 4. Geology

ANNEX III - SPATIAL DATA THEMES REFERRED TO IN ARTICLES 6(B) AND 9(B) :

1. Statistical units ; 2. Buildings ; 3. Soil ;4. Land use ;5. Human health and safety ; 6. Utility and governmental services ; 7. Environmental monitoring facilities ; 8. Production and industrial facilities ; 9. Agricultural and aquaculture facilities ; 10. Population distribution — demography ; 11. Area management/restriction/regulation zones and reporting units ;12. Natural risk zones ;13. Atmospheric conditions ; 14. Meteorological geographical features ; 15. Oceanographic geographical features ;16. Sea regions ;17. Bio-geographical regions 18. Habitats and biotopes ;19. Species distribution ; 20. Energy resources ;21. Mineral resources

The model of ESDInet+ project for capacity building and awareness raising.

Along with and in support of the INSPIRE Directive and ever since the early decision of taking this initiative to set up an EU infrastructure for spatial data, the European Commission (EC) has established a number of activities. Research projects, thematic networks and pilot industrial projects have been financed in order to set up scientific, technical, operational solutions and practices together with exploring and setting up adequate and sustainable models for maximizing and exploiting the use of GI within the EU.

It is worth focusing on the capacity building and awareness raising in the terminals of the services chain. According to the already discussed features of the subsidiarity and applying the practice of the web services and their own architecture together with the principles of SDI regarding data and GI , the local authorities may easily be identified as the focus of the entire system.

eSDI-NET+[3] is a thematic network project aiming to the promotion of cross border dialogue and exchange of best practices on SDIs throughout Europe, bringing together and bridging key stakeholders of European SDIs and to realizing a platform for communication and exchange of knowledge at all levels, from local to global. It runs under the specific program *e*-Contentplus[4] which provides measures to make digital content in EUROPE more accessible, usable and exploitable.

Currently the network involves 21 participants all over Europe and includes Associations, Institutes, Universities, Private Companies whose work is related with Geographic Information, and promotes dialogue between them.

Since it has been demonstrated and deeply discussed that the local dimension plays the key role in the sustainability of SDI and of providing services to the citizens and interfacing the upper level of public administration mainly providing data and resources to it : the study of the model used in the afore mentioned project eSDI-NET+ it is useful for possible adaptation in different contexts and for understanding the real impact of legal frameworks related to SDI impact the local public authorities.

The main objective of the eSDI-Net+ project is the establishment of a "European Network on Geographic Information Enrichment and Reuse". Its intention is to bring together existing key players of Spatial Data Infrastructures (SDIs) and target users in a European Thematic Network to be established as a platform for cross-border dialogue, for information exchange, low-level technical discussions and high level decisions.

It is worth noting that some local public authorities play often the role of key players and target users of some advanced technologies and innovative solutions for providing services to the citizens according to the direct link and interface that they have with the territory and the population.

If local public authorities, even of different nations, are able to share experiences, knowledge and possibly data in a network, this builds an absolute capacity for making national and international SDI sustainable.

It has been also demonstrated that the commonalities increase descending the scale of the services, therefore the final local service closer is to the citizens more is it is similar to another service differently located.

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[3]   http://www.esdinetplus.eu
[4]   http://ec.europa.eu/information_society/activities/econtentplus/index_en.htm

The network aims at increasing awareness of the important role that SDIs play in the efficient and effective acquisition, access, enrichment and reuse of Geo Information (GI), to permit the creation of integrated guidelines, standards, and implementation of best practices. It meets the need to build a forum for the many initiatives and SDI stakeholders across Europe especially acting on a local level.

Therefore the communication mechanisms between the European and the sub-national level are addressed in order to maximize the benefits of all initiatives (e.g. in Europe at the moment INSPIRE, GMES, Public Sector Information directive, etc.) , regarding digital GI content. All potential barriers of this process are and will be addressed during the project, such as cultural und linguistic barriers, technological and organizational barriers as well as legal barriers.

One of the most important communication mechanisms between the European and the local level used in this project are the workshops organized by the eSDI-Net+ project partners and coordinated by EUROGI. The first step towards these workshops is the identification and analysis of existing best practice SDI solutions on the sub-national level. The next step following the workshops where the best practices are mapped against the user needs and the results of the analysis are outlined, is the Best Practice Award (which specifically will take place in November 2009) where all the best practice SDIs identified by the project partners can participate. The Award will be assigned according to a grading process based on several indicators that have been largely discussed and agreed within the project. They have been based on the results of the previous national workshops therefore the connection to the real world of national and sub-national practices using GI is fully insured.

The macro-criteria on the basis of the evaluation and grading process are : quantity , quality, cooperation and subsidiarity, sustainability, users and usability . They generate specific indexes which have been used to assign scores to each of the analyzed SDIs . At the moment of writing the paper (Sept. 2009) almost 120 SDIs asked to participate to the previously mentioned award and by this way willing to be examined.

In terms of composition of the group of the partners of the project four stakeholder groups are represented within the consortium. The **Providers of geographical data** like local, national and regional public authorities are represented directly several partners as well as indirectly by the GI umbrella association EUROGI that cover the majority of European countries with his members. Intergraph and the GI umbrella associations speak for the private organisations and institutions that create, collect or own digital geographical data. Their expertise is needed for the identification of local, national and regional SDI best practices, for dissemination and raising awareness and, of course, for monitoring the implementation of standard solutions. **Users of digital geographical data** are represented by research institutes, universities, software manufacturers and public authorities. Their role within the project is to evaluate the best practice solutions as their expertise lies in the knowledge of State-of-the-art, reference applications and technology development. Since software manufacturers and public authorities often are users and providers of geographical data at the same time they are also represented within the project as partners.

National and international GI umbrella associations , through their partnership in the project, merge GI providers and users, interested organizations and entities from all over Europe. This coverage helps to disseminate the eSDI-Net+ Project and to raise local, regional, national and international awareness for the goals of the project

and the involved SDIs. Moreover, the GI umbrella associations are an important factor for the transfer of expertise.

Consultancy and Network Management, as well as dissemination and awareness raising are the major tasks of project coordinator with support of some of the GI umbrella associations.

The main idea of networking user , producers, researchers, managers of GI may be easily summarized. The use of GI has been in place for quite some time but has not been characterized by any interoperability. In order to achieve the SDI task, it is necessary to make sustainable the usage of GI within the Public Administration processes. Sustainability for using GI means that concrete results should be achieved and integrated into real services offered to the inhabitants and then be used efficiently by them. To evaluate SDIs in order to check the real effectiveness of the GI services offered by the Public Administrations represents an efficient tool for creating synergies and let understand each other for fostering interoperability. In fact the findings of several projects and researches state that no user community may be built and/or convinced to use a specific technical solution without motivating and training the users to join on the basis of a robust exchange of ideas and experiences.

Conclusions and recommendations.

This paper has focused on the specific model of one project developed in support of what Europe has already established and has developed towards the SDI and that many European local public administrations are putting into reality and supporting .

Europe is also aware that SDIs generate financial, political, socio-economic, commercial and technical benefits and because of this it is investing at Community and at MS level.

Since the SDIs are globally pervading our earth it may seem reasonable to consider for evaluation the already discussed and experimented model of a thematic network for creating a network of SDIs in other areas of the globe.

The model of thematically networking SDIs has not to be confused with the model of an ideal SDI.

It has already been largely demonstrated that the success and the efficiency of SDI is strictly dependent on how it has been designed, organized, populated by data, how it satisfies the need of end users, how it is locally dependent and centrally related. According to this, the idea of having a unique model for setting up an SDI is far from being truly sustainable. Having the same ingredients each SDI has its own characteristics insuring its absolute interoperability. Therefore the networking and the constructive dialogue among stakeholders, users, potential users, developers and institutions is highly needed.

Some points might be considered suitable for building initiatives and recommendations:

- GI is based on locally based knowledge of communities;
- SDI should insure the exchange of most of the data locally and centrally originated;
- GI based knowledge and activities should be fostered for the benefit of the local communities;
- GI should be used for mitigating the divide among areas and communities;
- Services may be built on GI, they may be delivered directly and remotely.