

# **The European Surveying Plot – A surveying map of land property: A proposal and it's perspectives**

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## **SUMMARY**

This paper presents a proposal for a surveying map of land property with common European specifications for every member state of the E.U., based upon the tendency that grows among E.U. for an active political union between member states. The legal frame imposed by the INSPIRE directive is the basis for this proposal. The European Surveying Plot is a typical surveying map for land property drawn by certified surveyors from all E.U. countries and should be valid to be used in administration services of every state. The implementation of this project requires several problems to be tackled such as technical issues concerning the reference systems, map projections, scales, symbols, format, etc. There are also legal issues that require thorough analysis on E.U institutions such as the language to be used, the validation that the European Surveying Plot should have etc. Finally, this article proposes a methodology on the steps that should be followed by the institutions involved in order to complete this project.

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## **1. INTRODUCTION**

The proposal for the European Surveying Plot derives from a general frame of creating a more solid political and administrative union among the E.U. member states. This type of union involves the unification of the geospatial information owned by each member state. Since 2007 a specific legal frame has been imposed to manage the geospatial information on E.U. and this is the *INSPIRE directive*. This directive introduces interoperability between the National Geographic Organizations of the member states, which means that geospatial datasets maintained by every country shall be public and accessible through a National Spatial Data Infrastructure.

The INPIRE (Infrastructure for Spatial Information in Europe) directive tries to resolve problems of spatial data availability, quality and accessibility maintained nationally in order to implement a frame of common European policy for the environment, agriculture, transport and energy. This directive introduces standard procedures for collecting and documenting spatial data, metadata, and the way the spatial information should be exchanged between the member states.

The proposal for the European Surveying Plot is based on the legal frame that is implemented by the INSPIRE directive and it is an entity that didn't preexisted and therefore shall be considered as an INSPIRE product or a product that is INSPIRE compliant. The public use of national geospatial datasets and their free disposal, is an opportunity given by the INSPIRE directive that is crucial for the European Surveying Plot considered the fact that the proposal refers to a surveying map of land property in any given country, member of the E.U. and this map should be valid to be used in legal actions or in administration services of every member state of the E.U. Regarding the fact that this is an INSPIRE compatible proposal the structure of the European Surveying Plot shall take into consideration all the INSPIRE regulations referring to the technical specifications and the legal status of the proposal, in order to achieve the required compatibility of the geo-data used.

## **2. INSPIRE REGULATIONS**

The coordinate reference systems used in the majority of the European region are linked to the Eurasian tectonic plate. Since INSPIRE Directive affects areas that are not on the Eurasian tectonic plate, it is necessary that the rules concerning coordinate reference systems take also into account areas that are not considered to be on the Eurasian tectonic plate. This kind of situation occurs, for example, in the European countries' overseas territories. The International Terrestrial Reference System (ITRS) [IERS] is presently the recommended Terrestrial Reference System (TRS) for the whole geo-science community, through a resolution adopted by the International Union of Geodesy and Geophysics (IUGG) during its General Assembly of Perugia in 2007. The primary realizations of ITRS are created through an optimal

combined use of space geodetic techniques; they are released to the international community and labeled International Terrestrial Reference Frames: (ITRF<sub>y</sub>). These primary realizations are also densified and disseminated through regional, national and local terrestrial geodetic networks. The European Terrestrial Reference System 1989 (ETRS89) [EUREF] is related to the ITRS and its realizations are designated by European Terrestrial Reference Frames: (ETRF<sub>y</sub>). The European Vertical Reference System (EVRS) [EUREF] is the vertical reference system recommended for Europe on land to express gravity-related heights. The most recent realization of the EVRS is labeled European Vertical Reference Frame 2007 (EVRF2007). The definition of EVRS is described in the EVRS Conventions 2007.

In 14-15 December 2000 the “Map Projections for Europe” workshop was organized to propose the map projections to be used for representation of data in plane coordinates in general applications. The use of the following projections was recommended:

- Lambert Azimuthal Equal Area (ETRS89-LAEA) for spatial analysis and display;
- Lambert Conformal Conic (ETRS89-LCC) for conformal pan-European mapping at scales smaller or equal to 1:500,000;
- Transverse Mercator (ETRS89-TM<sub>zn</sub>) for conformal pan-European mapping at scales larger than 1:500,000.

The INSPIRE directive follows these recommendations and requires the use of either of the Lambert projections, or the Transverse Mercator. For overseas territories of European countries shall be used different map projections that fit better to the specific location.

Since 1990 the ISO standardization is applied in many products and services including spatial information as expressed through GIS, topology, symbols, and the definition of reference systems.

Finally, it is important to mention that INSPIRE directive follows the ISO standards in every field that applies. FIG has a leading role in establishing ISO standards in surveyors’ work and there many studies carried out on the use of ISO standards in fields of professional practice of surveyors. The table below shows the main ISO standards adopted by INSPIRE concerning the spatial data and geographic information.

Standard Name	Date of Issue	Description
ISO 19111	2007	Geographic Information – Spatial referencing by coordinates
ISO 19111-2	2009	Geographic Information – Spatial referencing by coordinates – Part 2: Extension for parametric values
ISO 19115	2005	Geographic Information – Metadata
ISO/TS19127	2005	Geographic Information – Geodetic Codes and Parameters
ISO 2533	1975	International standard atmosphere
ISO 6709	2008	Standard representation of geographical point position by coordinates

*Table 1.1 ISO Standards as followed by the INSPIRE Directive*

### 3. DEFINING THE EUROPEAN SURVEYING PLOT

#### 3.1 Technical aspects

The European Surveying Plot should adopt all these technical specifications needed in order to be considered as an adequate surveying map, in technical scope (reference system, map projection, scale, layout, etc) and at the same time all these specifications should be INSPIRE compatible.

The primary issue that needs to be considered is the format that the European Surveying Plot should have. There are two basic options, the analog - printed format and the digital. The first format is the typical format that we are used to, when handling or creating a map or a plot. The advantages of this format for the European Surveying Plot are imminent as we can create a map to be used in certain legal actions such as contracts for buying or selling land property, or in cases of mortgages. On the other hand, the digital format provides other advantages such as the fact that the European Surveying Plot can easily be transferred throughout Europe for administrative purposes as it may be a CAD or CAD – compatible file that can be sent via e-mail or uploaded in the Internet. Needless to say that these two formats are connected because the analog format is created using a CAD program and therefore the European Surveying Plot can adopt both formats. On top of that, a unique file type (eg. .ESP) can be created that embeds all the special characteristics that will be given to the European Surveying Plot such as symbols or a specific layout.

Another important issue is to define and categorize in layers the spatial information represented on the European Surveying Plot. Those layers shall be determined in advance and they should cover every possible entity that may appear on surveying maps conducted in all E.U. countries. The entities (eg. buildings, boundaries, roads, etc) should be classified in main layers according to relevance and must follow a top – down structure, going from general to special. This practice is used mapping products of large scales around the world such as the Ordnance Survey MasterMap<sup>®</sup> or the Canadian Toporama. An indicative group of layers may be the following

- Property boundaries
- Buildings
- Other constructions
- Public Networks (electricity, telecommunications, etc)
- Transport networks (Highways, roads, railway, etc)
- Administration boundaries
- Layout

A structural aspect of the European Surveying Plot is the choice of the reference system and the map projection that should be used. According to the INSPIRE directive regulations, the proposed reference system is the ETRS89 according to a realization frame ETRFyy referring to some epoch. The majority of the European member states provide national satellite positioning systems using GNSS systems which adopt ETRS89 based reference systems. On top of that, EUREF is the institution that provides the European Permanent Network (EPN) which is a network of 245+ permanent GPS stations around Europe that provide the a

realization frame for ETRS89. Therefore the adoption of ETRS89 is the choice that complies with all the criteria set for a pan-European reference system. The map projection that is proposed for the European Surveying Plot, is Transverse Mercator divided in zones of 10° in order to cover the European continent and at the same time minimize the linear deformation of the projection. For overseas territory of European countries a best fitting projection shall be chosen. Apart from the mapping grid, there also can be a gradicule of geocentric coordinates ( $\phi, \lambda$ ) in an ITRFxx in order to provide navigational information for the parcel.

Finally, there are a group of European Surveying Plot layout components that should be included, regarding the general information of the plot. The layout should be standard, including information such as:

- A unique parcel number for the property (eg. cadastre)
- Surveyor's ID
- A table of coordinates
- A table benchmarks used (for surface surveying methods)
- Driving directions to the parcel
- Datum
- Scale

The proposed scales for the European Surveying Plot may vary according to the area and the location of the property. For urban areas 1:200 scale is suggested and for rural areas 1:500 – 1:1,000 in cases of large properties.

### 3.2 General Aspects

Apart from the technical aspects of the proposal, there are numerous general issues that should be tackled in the process of creating the European Surveying Plot. The main issues are presented here.

As mentioned before, the European Surveying Plot is proposed to be a surveying map of a certain land property showing its boundaries, area and side dimensions. Regarding the fact that the Plot will be conducted under common European specifications, the display of boundaries issue is critical. The property status among European member states is rather complicated and may vary from country to country because it is related to political and historical influences. In order to draw the European Surveying Plot for a property in any given country, the surveyor must have a thorough knowledge of the current property status. The existence of a modern Cadastral system which can provide the surveyor with the essential information about either spatial data, or legal status of the parcel, can prove quite helpful and may lead in an accurate European Surveying Plot in terms of the property boundaries.

Another critical issue that should be overcome is that of the language that the European Surveying Plot shall use. The European Union of 27 member states adopts 22 official languages. This fact means that there will be a significant difficulty in choosing the language of the Plot. It is proposed to use the official language of the country where the property is located in order to overcome obstacles that may appear in case of using the Plot in public administration services, or contracts. Whether this is not possible, the suggested language will be the English, as it is the most widespread in global level.

Apart from the language there is an issue of the symbols of the European Surveying Plot. It is suggested to create a unique library of symbols and symbolisms for every possible entity that may be needed to display on the Plot. This library shall be ISO compliant and defined in an European-wise way, in order to associate this library to the available design programs.

Finally, there is an issue of the validation of the European Surveying Plot. This requires thorough analysis of the way that public administration functions in every member state. There should be extended consultation between member states representatives in high level in order to document all the special features of every country, and reach a level of common usage for the European Surveying Plot.

#### **4. THE STAGES OF CREATING THE EUROPEAN SURVEYING PLOT**

In this chapter is given a proposal on the methodology for the process of creating the European Surveying Plot. This process consists of three stages which need to be taken in order to adopt a specific feature of the European Surveying Plot. These three stages are the suggested standard procedure for every issue that needs to be resolved (eg. creating the symbols library for the plot).

- Stage 1: National discussion. At the first stage, every single country should organize a European Surveying Plot committee consisting of the National Mapping Authority and the official association of surveyors of the country, or the technical chamber that surveyors are represented. This committee should carry out an analysis on current national status of every single issue that is going to be discussed on European basis, and submit a national proposal for discussion.
- Stage 2: European Surveyors' Organizations filtering. At the second stage every proposal from each member state should be submitted to a European authority in order to be examined, analyzed and filtered in comparison to other countries proposals for the same issue. The role of the coordinator should be carried out either by EGoS, CLGE, EUROGEOGRAPHICS, or even better by all these Organizations forming a special coordinator for this project.
- Stage 3: E.U. Institutions revision. Every filtered proposal by the coordinator organization shall be submitted for final approval in the EU. For this reason it appears necessary to form a committee that processes those proposals in cooperation with the European Parliament and the EU commission, in order to give the final approval to the proposal. If the proposal is approved, is incorporated in the ESD. On the contrary, if it is rejected for any reason, shall be returned to the coordinator for further revision, followed by certain instructions by the EU.

#### **5. CONCLUSION**

The proposal for the creation of the European Surveying Plot is very complicated and quite ambitious at the same time. The current legal status implemented by the INSPIRE Directive creates great a potential of realizing this proposal. This proposal is a great opportunity for the introduction for the first time, of common European technical specifications for surveying

maps representing land property. At the same time, there are new professional opportunities that emerge for certified surveyors across Europe, who may have access in other European markets than their country of origin. Finally, with the implementation of this proposal, the Surveyors' Organizations across Europe take a leading role in terms of supervising the process of creation the European Surveying Plot.

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Additional and further information can be found at CLGE ([www.clge.eu](http://www.clge.eu)), EGoS ([www.europeansurveyors.org](http://www.europeansurveyors.org)), FIG ([www.fig.net](http://www.fig.net)), IAG ([www.iag-aig.org](http://www.iag-aig.org))

## BIOGRAPHICAL NOTES

Nikolaos Kalamakis Holds a Dipl. in Rural and Surveying Engineering from the Aristotle University of Thessaloniki (Greece), a M.Sc. in high precision surveying applications from Department of Geodesy and Surveying of Aristotle University of Thessaloniki and at the moment is a Ph.D. Candidate in the Department of Geodesy and Surveying of Aristotle University of Thessaloniki. He is a Surveying Engineering professional running a private office since 2008, member of the Hellenic Association of Rural and Surveying Engineers (HARSE), member of the Technical Chamber of Greece (TCG). He has presented his postgraduate Thesis in 2011 annual meeting of EGoS, in Thessaloniki (March, 2011).