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Proposal of CORE Standards of the Americas **

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** Prepared by the Working Group on Standards and Technical Specifications (GTnet)



Proposal of CORE Standards of the Americas 2013



CP-IDEA

PERMANENT COMMITTEE FOR
GEOSPATIAL DATA INFRASTRUCTURE
OF THE AMERICAS

**PERMANENT COMMITTEE FOR GEOSPATIAL DATA
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Permanent Comite for Geospatial Data Infrastructure of the Americas
(PC-IDEA)

Proposal of CORE Standards of the Americas

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PC-IDEA Working Group on Standards and Technical Specifications (GTnet)

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I. Introduction

1. Background

The objective of the Working Group on Standards and Technical Specifications (GTnet) is focused on the development of a series of activities designed to obtain a set of standards and technical specifications that apply to the region as a whole, beyond national specifications. This set will promote the development and harmonization of spatial data infrastructures (SDIs) in each country and get closer to the consolidation of the Geospatial Data Infrastructure for the Americas (IDEA).

Accordingly, during the first half of 2011 two activities related to this proposal were developed:

- Preparation of a document showing the standards framework overview in the region, and establishing the conceptual basis for the integration of geospatial data through the use of standards.
- Design and questionnaire administration for the diagnosis of the regulations state of the art, which results show the conditions of standards application in the region, highlighting, among others aspects, the standards being produced and the priority themes to be regulated.

2. Objective

To develop a fundamental standards or "Core Standards" proposal for the region.

The starting point is the fundamental data definition in order to establish the set of "Core Standards", then the fundamental data themes and transversal themes to be ruled within a Spatial Data Infrastructure (SDI) are proposed, after that a first proposal is delivered for the Permanent Committee on Geospatial Data Infrastructure of the Americas (PC-IDEA) member countries consensus.

3. Rationale

It is necessary to define, generate and establish a set of standards that help to ensure thematic definition applicable to the entire region and regulate the geographic information production in order to harmonize the existing one in some countries and encourage its generation where it is not available. It is not intended to centralize information, but that the corresponding authority of each PC-IDEA member country be responsible for its maintenance and availability, in order to access data transparently and interoperably.

International standards and best practices on the defined themes will be the basis for the generation and adaptation of the set of standards and technical specifications to create a homogeneous regional profile which enables its implementation in the PC-IDEA member countries.

To comply with a thematic and ruling definition involving a strategic plan for the development of the SDI for the region, it is necessary to resume the idea of the "Tower of Babel" in order to build a large interoperable building having clear the same concepts and speaking the same language.

It corresponds to the GTnet to present the countries situation with respect to their fundamental data regulations production; however, the purpose of this work is not only the comparison of the regulations status in the different countries, but also to move towards initiatives that strengthen the SDIs integration developing standards to be implemented beyond national boundaries, thus enabling the development and harmonization of the national SDIs and advancing in the IDEA strengthening.

4. Methodology

- To carry out a documentary research to determine the conceptual basis for the "Core Standards" definition.
- To analyze the results of the PC-IDEA Questionnaire 2011 administration. The results in the *Standards and Technical Specifications* section show the conditions of the standards implementation in the region, highlighting among other things the standards produced and priority themes to be regulated; as well as their comparison with PC-IDEA Questionnaire 2008.
- To perform direct consultation of each PC-IDEA member country portals available, identifying common data sets in the region, based on the proposed category for the national framework SDI Cookbook 2004 and the initiative of the Infrastructure for Spatial Information in the European Community (INSPIRE).

II. Conceptual Basis for the “Core Standards” definition

For the aims of this document, the definition of the standards framework as part of the IDEA will help to propose a set of standards and technical specifications related to the geospatial data and information collection, display, organization, storage, documentation and exchange for contributing to their good management and providing coordination mechanisms, management, and access, considering the provisions of the International Organization for Standardization (ISO) and the Open Geospatial Consortium (OGC). However, it is important to start with the definition of a "core standards" or fundamental standards proposal, which will be the basis for the region policy framework, once a common conceptualization for "core standard" be established.

1. “Core Data” or Fundamental Data

The terms core data, framework data, reference data, basic data, fundamental data and others are often used and seen as similar, until the related specifications or concepts are to be defined (Nebert 2004). Here are some examples of their different perspectives:

a) Framework Data or Reference Data

Data set that enables to relate, "refer", external information with the real world, by means of its representation in the geographic information (GI) and therefore can be considered to include a reference for the GI user.

b) Core Data

Data set necessary for the optimal use of many GIS applications, providing a spatial reference sufficient for most data geographically located.

c) Fundamental Data

Data set for which several government agencies, regional groups or industry groups want a comparable national coverage to achieve their corporate objectives and responsibilities.

Each initiative has also adopted some of these terms according to their own perspective and needs, as exemplified in the cases of Table 1:

Country	Concept
Canada	The Canadian Geospatial Data Infrastructure (CGDI) describes the framework data as the set of continuous and fully integrated spatial data that provide context and reference information for the country. The framework data are widely used to support or enable most geospatial applications (GeoConnections n.d.).
Spain	In the Spatial Data Infrastructure of Spain (IDEE) reference data are the fundamental georeferenced data and backbone to build or reference any other fundamental or thematic data. They are the framework that provides the geographic context to any application. They fulfill the function of being the reference geographic information used as a common basis which enables to mix and integrate data from all kinds of applications being the link or nexus (IDEE Geographic Superior Council n.d.).
Colombia	The Colombian Spatial Data Infrastructure (ICDE) considers as fundamental data , basic geospatial data of national or local coverage, which in turn represent the phenomena relevant to the development of the country, these data are the basis for generating other spatial data (thematic data or value-added data). Fundamental data are generated to facilitate the production and use of geographic data, reduce operating costs and support decision making (Research and Development Center in Geographic Information n.d.)
Mexico	As part of the of the Spatial Data Infrastructure of Mexico (IDEMex) conceptual model the fundamental data are those with which it is possible to construct buildings of logical, consistent, accurate, rational and interchangeable information. They should enable the analysis and be able to accept overlapping datasets of any kind, provided that they meet the standards and specifications for such data (National Institute of Statistics and Geography, 2009)
Argentina	In the conceptual basis of the Spatial Data Infrastructure of the Argentine Republic (IDERA) the reference data are defined as those georeferenced fundamental data which are the basis for the construction and/or reference of other data. They are the framework that provides the geographic context to any application. They fulfill the role of being a common ground that enables combination and integration of data into applications of all kinds, to build new data or generate useful information (IDERA Coordinating Team n.d.)

Table 1. Core Data Concepts

Thus, for the purposes stated in this document the term **Core data or Fundamental data** will be used:

“Those data that are the backbone or spine to build or reference any other fundamental or thematic data which constitute the framework that provides the geographic context to any application”.

2. “Core” Standard

As part of the investigation process no source or citation related to this concept was found, in this regard it is proposed that this definition be established considering the applicability of the standard in two ways:

a) *To regulate fundamental data*

When the rule is directly applicable to any field defined as "core data" or fundamental data.

b) *To regulate data sets transversally*

Including those defined as "core data" or fundamental data.

In this regard, the definition of Core Standard is proposed:

“Set of rules issued by an authority that establish the requirements, specifications, parameters and allowable limits to be observed in the development of activities related to the collection, processing and dissemination, either for fundamental data individually or as data groups transversally within a spatial data infrastructure”.

III. "Core Standards proposal for PC-IDEA

1. Theme proposal for fundamental data

There are several classifications for Fundamental Data themes, which are established by each country and agency based on their needs and requirements, as shown below:

- a) The INSPIRE initiative in its directives considers the following reference data (European Parliament and Council 2007):
 - Coordinate reference system
 - Geographical grid systems
 - Geographical names
 - Administrative units
 - Transport network
 - Hydrography
 - Protected sites
 - Elevation
 - Addresses
 - Cadastral parcels
 - Land cover
 - Orthoimagery

- b) According to the document "Developing Spatial Data Infrastructures: The SDI Cookbook" (Nebert, 2004) a variable number of geospatial data can be considered common and of national importance as data "framework" that may be growing when identified and promoted as necessary for applications and user environments increasingly advanced. Among the framework layers that are proposed in a national context include:
 - Cadastral information
 - Geodetic control
 - Geographic feature names
 - Orthoimagery
 - Elevation
 - Transportation
 - Hydrography (surface water networks)
 - Governmental units

- c) Drawing on these classifications as well as the information available on the websites of national mapping agencies and the response of 17 countries to the PC-IDEA 2008 questionnaire, a comparative analysis of SDI in America was made, and the result is presented in Table 2.

The PC-IDEA 2008 questionnaire was divided into 28 questions, of which questions 5 and 6 are related to the present proposal:

5. Which are the spatial data groups with national or wide coverage now available in your country?

5. What available technical standards for spatial data do you have?

Country	ARGENTINA	BELIZE	BOLIVIA	CANADA	CHILE	COSTA RICA	BRAZIL	COLOMBIA	CUBA	JAMAICA	MEXICO	GUATEMAL	ECUADOR	EL SALVADOR	GLYANA	PANAMA	URUGUAY
Geodetic references [☆]	I	I	I	I N L	I	I	I N L	I N	N	N	N	I L I L	I L	L	L	IPGH	L
Boundaries [☆]	I	I N	I N	N L	I N	I N	I N L		N		L	I L		L		IPGH	N
Landmasses [☆]	I N	I			I N L	I			N				I N L			IPGH	IPGH
Submarine		I			I		I N										I
Elevation [☆]	I N	I		N L		N	I N				N	I L	I L	L			
Aerial photogr		I	I N		L	I	L				N	I L	I L	L		IPGH	
Satellite	I	I		I	L	I	L							L			
Hydrographic network	I	I	I N	N	L	I	L		N			I L	I L	L	N L	IPGH	
Transport networks [☆]	I N	I	I N	I N	L	I	L		N	N		I L	I L	L		N	
Cadastre			I N	N		I	L		N	N	N	I L		L			N
Geographical names [☆]			I N	I N	L	I	I N L		N		N L	I L		L		IPGH	N
Geology		I		I	L	I	N L				N	I L			L		
Edaphology		I		I N	L						N	I L	I L				I
Surface water [☆]		I			L				N			I L					I
Underground water		I		I N	L							I L					
(1)Climate		I				I					N	I L					I
(2)Climatic																	
Land use and vegetation		I		I N		I	N L				N	I L			L	I	I
Primary vegetation		I			L							I L				I	
Potential wetlands		I		I N		I			N			I L				I	
Population and housing		I N		N	N L	N	I N L					I L		L	L	I	N
Agriculture				N	L	N	I N L					I L					
Economy				N	L	N	I N L					I L				L	

[☆] GSDI Checklist prepared by user.
 The country did not specify why the space is blank (but the theme data producer or other reason).
 They do produce this kind of data but without standard.
 They use international standard for national use without specifying international agency.
 National standard without reference to international standard.
 Local theme, national resolution.
 Adherence to FAIGH standard.

Table 2. SDI Comparative Analysis in America

The countries analyzed are the following:

Country	National Cartographic Agency
1. Argentina	National Geographical Institute (IGN), Argentine Republic www.ign.gob.ar
2. Belize	Lands and Surveys Department Through The Land Information Center http://www.mnre.gov.bz/departments/lands-and-survey
3. Bolivia	Military Geographical Institute (IGM), Bolivia http://www.igmsantacruz.com
4. Brazil	Brazilian Institute of Geography and Statistics (IBGE) http://www.ibge.gov.br/home
5. Canada	Branch of the Earth Sciences Sector Natural Resources, Canada http://www.nrcan.gc.ca/home
6. Chile	Ministry of National Property http://www.bienesnacionales.cl
7. Colombia	Geographical Institute Agustín Codazzi http://www.igac.gov.co/igac
8. Costa Rica	National Geographical Institute (IGN), Costa Rica http://www.mopt.go.cr
9. Cuba	National Hydrography and Geodesy Office http://www.iderc.co.cu
10. Ecuador	Military Geographical Institute, Ecuador http://www.igm.gob.ec
11. El Salvador	National Cadastre and Geographical Institute http://www.cnr.gob.sv
12. Guatemala	National Geographical Institute "Engineer Alfredo Obiols Gomez" (IGN) www.ign.gob.gt
13. Guyana	Guyana Lands & Surveys Commission (GLSC) http://www.lands.gov.gy/regional.html
14. Jamaica	Land Information Council of Jamaica http://www.licj.org.jm
15. Mexico	National Institute of Statistics and Geography (INEGI) http://www.inegi.org.mx
16. Panama	National Geographical Institute "Tommy Guardia" http://ignpanama.anati.gob.pa
17. Uruguay	Military Geographical Service (SGM) http://www.ejercito.mil.uy/cal/sgm/index.htm

d) In summary and considering the framework layers that are proposed in a national context suggested in the Cookbook, as well as the national standards associated with these issues, we obtain the following information, Table 3:

	Cadastral information	Geodetic control	Geographical names	Orthoimagery	Elevation	Transport networks	Hydrography	Governmental units
Argentina								
Belize								
Bolivia								
Brazil								
Canada								
Chile								
Colombia								
Costa Rica								
Cuba								
Ecuador								
El Salvador								
Guatemala								
Guyana								
Jamaica								
Mexico								
Panama								
Uruguay								

National data set
 National Standard

Table 3. SDI Comparative Summary in América

Consequently, it is possible to deduce that the national coverage data sets that appear the most in this group of countries and also have a national standard are:

- Geodetic control
- Geographic feature names
- Transport networks
- Governmental units
- Cadastral information

e) On the other hand, with reference to the results obtained by the application of PC-IDEA Questionnaire 2011 (20 countries, added to the 17 countries results in 2008), in section 3, *Technical Standards and Specifications*, it is possible to determine that the national priorities of standards production, with respect to geospatial themes and activities, as shown in Figure 1, are:

- Geodesy
- Geographical names
- Relief
- Boundaries
- Topography

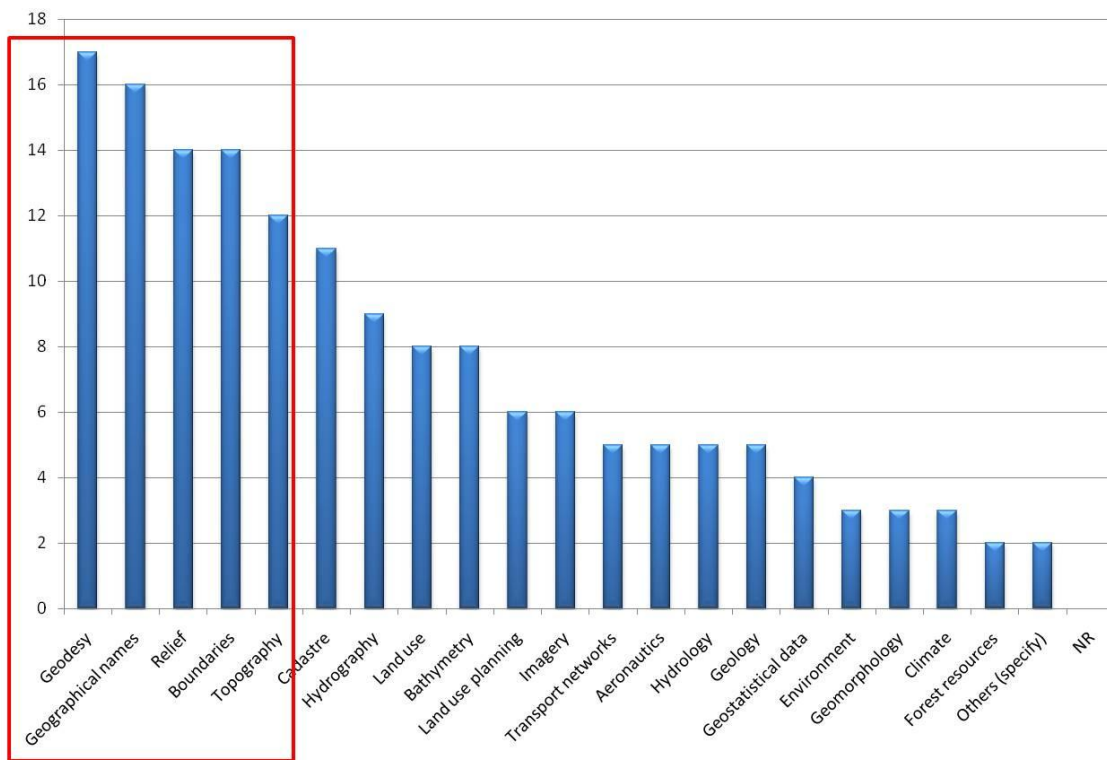


Figure 1. Number of countries producing geospatial information standards

f) Also the Questionnaire 2011 results enable to determine the themes in which regulations are applied, as well as type or scope, noting that Core Data or fundamental data are those for which there is a greater standards use, as shown in Figure 2, the top five are:

- Geodesy
- Boundaries
- Relief
- Geographical names
- Topography

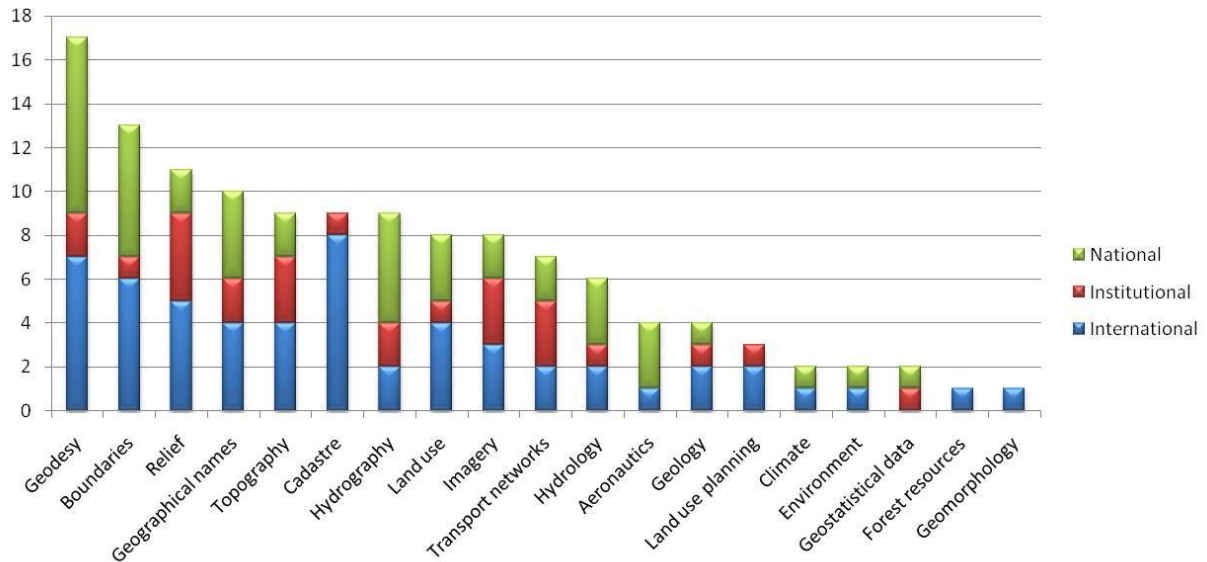


Figure 2. Number of countries using geospatial information standards on different themes

Note: Surveying is included considering it is dealt as both a theme and an elemental reference layer in the data classification of several countries.

2. Transversal theme proposal

According to the Royal Academy of the Spanish Language, the term *Transversal* is used as an adjective to refer to something: "What lies or spreads from side to side" or "What perpendicularly intersects something else".

Based on the above definition, it is possible to determine the regulatory themes that may be considered as *transversal* within a SDI because their scope or application involve all geospatial data sets, whether fundamental, thematic or value-added, as shown in Figure 3:

1. Geodetic reference system
2. Metadata
3. Geospatial data modelling
4. Interoperability
5. Geospatial data quality

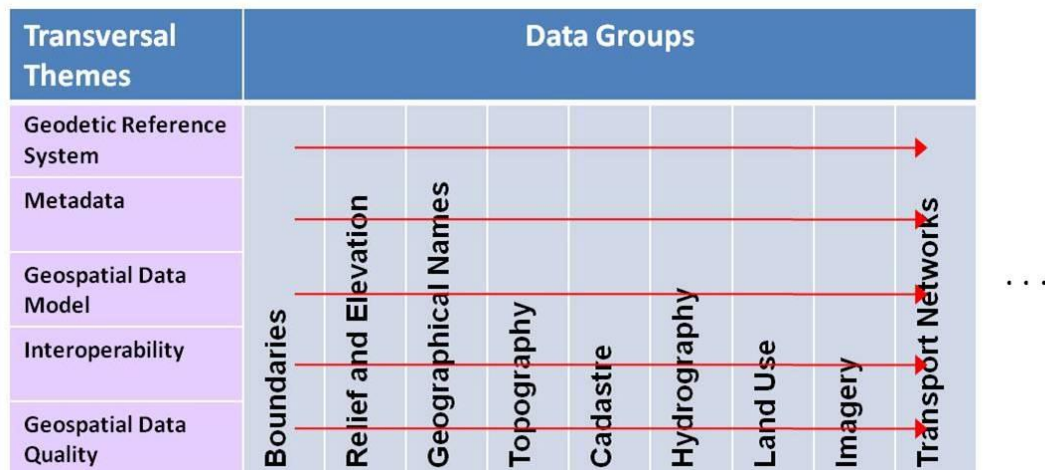


Figure 3. Transversal themes

3. “Core Standards Proposal”

Considering what has been exposed for the standards proposal with respect to the fundamental data themes and the transversal themes, now it comes to establish the criteria for the "Core Standards" development as priority for the region:

- **With respect to the fundamental themes of interest:**
 1. Boundaries
 2. Hydrography
 3. Relief
 4. Transportation networks (road, rail, air, ferry, etc.)
 5. Geographical names

- **With respect to the transversal themes:**
 1. Geodetic reference system
 2. Geospatial data model
 3. Metadata
 4. Interoperability
 5. Geospatial data quality

V. Conclusions

- Each country has its own thematic classification to specify the core data, frame data, fundamental data or reference data; however, all of them are essentially in the same basic data despite the name given to them. Thus, we can see that the trend toward normalization of these specific issues does not present major changes, as reported by the member countries in 2008 and 2011.
- The diagnosis obtained from the analysis of the regulations state-of-the-art in the region, reflected from the PC-IDEA Questionnaire 2011 administration, and answered by 20 member countries, should be an important reference in order to establish the guidelines in the development and implementation of regional standards that may constitute the "core standards" or fundamental standards framework on which to sustain the development and strengthening of the IDEA, so contributing to the development of national initiatives.
- From the transversality point of view, it is required to implement a group of "core standards" or fundamental standards that enable their adoption and use in alignment with national initiatives and standards.
- Importantly is to emphasize that each national initiative has adopted a set of terms associated with its own SDI and datasets that comprise, according to their own perspective and needs, so it is necessary to work on the adoption of a common language that provide a support to face challenges beyond the national level and point towards a greater regional interoperability.
- With the development of this proposal Mexico -as coordinator of the Working Group on Standards and Technical Specifications- is answering to the third activity regarding "Developing a Core Standards or fundamental standards proposal for the region", which was sent to the Gtnet members for its revision in order to be agreed and refined.
- The final version was approved on the 10th PC-IDEA Plenary Meeting held in New York in August 22nd 2013.

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