POLSKIE TOWARZYSTWO INFORMACJI PRZESTRZENNEJ
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RECENT DEVELOPMENTS IN NATIONAL GEOGRAPHIC INSTITUTE OF SPAIN

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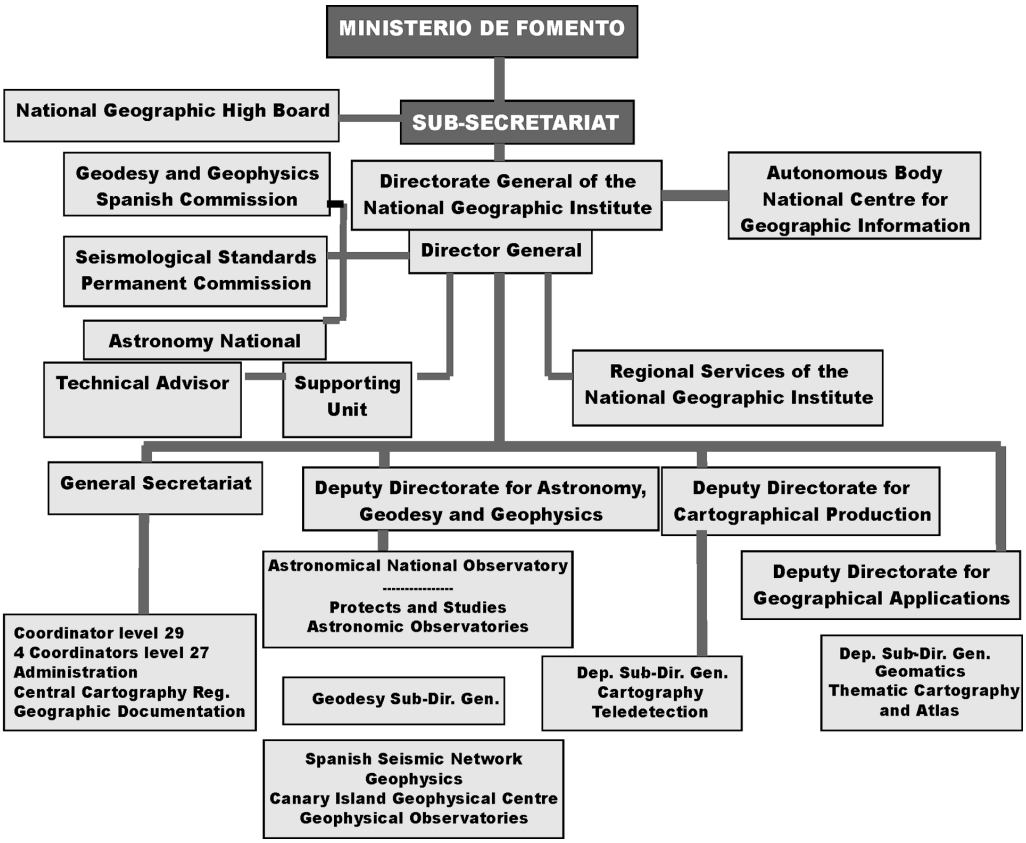
Commitments assigned by Law to the IGN-E

The National Geographic Institute of Spain (IGN-E, *Instituto Geográfico Nacional – España*) is a Directorate General dependant on the Spanish Ministry of Infrastructure and Transports (*Ministerio de Fomento)*.

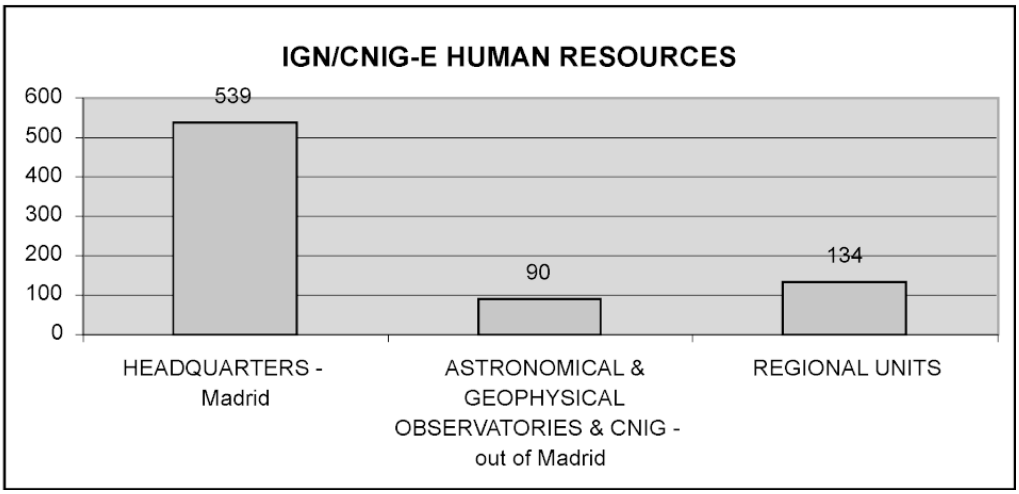
Commitments assigned by Law to the IGN-E are:

- Astronomical observation and research. Radio-Astronomy. Astronomical equipment development. Astronomical and Geodetical uses of VLBI technology.
- Observation, computing and maintenance of National Geodetic Networks, National High Accuracy Levelling Network, National Mareographic Network. Research and geodetic and geodynamic uses of GPS technology.
- The National Seismological Network control and maintenance. The Dissemination of Seismic information. The Co-ordination of Seismological standards. The control on the volcanic activity within the Spanish National Territory.
- Geophysical research. The Observation control and research of the Terrestrial Magnetic Field. Gravimetric Research.
- Production and updating of the National Topographic Map series at 1:25,000 and 1:50,000 scales. Production of the National Derived Map series 1:200,000; 1:500,000; 1:1,000,000 and 1:2,000,000.
- Research, developing and cartographical uses of Photogrammetry and Remote Sensing.
- Developing and maintenance of the National Spatial Data Infrastructure (IDEE). Production, updating and uses of Geo-Databases, Digital Elevation Models and GIS.
- Production and maintenance of the National Atlas of Spain. Production of thematic maps needed by the Government of Spain.
- Maintenance of the Central Registry of Cartography, the National Gazetteer and the Administrative Boundaries of Spain.

Organisation



Human Resources



Finances

I G N-E			
BUDGET	2004	2005	2006
	(K euro)	(K euro)	(K euro)
HUMAN RESOURCE EXPENSES	16,246.95	16,571.89	16,545.38
MAINTENANCE, POWER AND WATER SUPPLY EXPENSES, OTHER EXPENSES	2,500.61	3,899.61	4,036.52
FEES, SUBSIDIES, GRANTS AND FELLOWSHIPS	1,389.37	1,973.37	5,157.35
GOODS AND SERVICES INVESTMENT	17,059.59	18,809.59	20,930.68
COOPERATION AND HARMONISATION FOR DATA ACQUISITION		4,842.00	4,842.00
SOUTHERN EUROPEAN OBSERVATORY AND PROJECT ALMA CONTRIBUTION	1,520.00	1,621.00	1,666,28
TOTAL IGN-E.	38,716.52	47,717.46	53,178.39

Strategic Plan 2004–2006

Vision

IGN-E wants to become:

The Spanish reference Public Institution, which through the formulation of policies, the application of high technology and the sector leadership, directs, plans, coordinates and manages, at the national level, the official data in the fields of Astronomy, Geophysics, Geodesy and Cartography, in order to assure the availability and reliability of geographic and spatial data, for use by Public Administrations, economic agents and society contributing to the progress of territorial knowledge, economic and social development and scientific and technical research.

Strategic goals

Goal 1: The plannig, coordination and management, at the national level, the official information in the fields of Astronomy, Geophysics, Geodesy and Cartography.

Goal 2: To guarantee the availability and reliability of the geographic, geophysical and spatial data for the Spanish State.

Goal 3: To contribute to the progress of territorial knowledge and to the scientific and technical research in specific areas of the Earth and to the Universe Sciences.

Goal 4: To cooperate in the Spanish social and economic development from its authoritative base.

Goal 5: To become a centre for administrative excellence and public service.

At 2007 these strategic goals are developed through 113 projects.

Strategic Projects to encourage and setting up the cooperative way to produce and management of harmonised GI in Spain

From the 113 projects running on 2007 it may be interesting to know some of them related with cooperative working in Spain among different governmental bodies to produce and manage Geographic Information.

The IDEE Project (National Spanish Spatial Data Infrastructure)

There are three levels of geographic information producers in Spain:

National Level: Government of Spain. The National Government is composed of 16 Ministries. Many of them are producers of Geographic Information, for example: Agriculture, Defense, Economy and Finances (Cadastre, National Statistical Institute (INE-E)), Infrastructures and Transports (IGN-E (National Mapping Agency), CNIG-E (National Centre of Geographic Information), Education and Science (Geological Institute of Spain (IGME), etc.

Regional Level: 17 Autonomous Regions + 2 Autonomous Cities (Ceuta and Melilla). Every Regional Government or Autonomous City Government is composed of Departments. Most of them are also producers of Geographic Information on their territories and always they have a Regional Mapping Agency or Service.

Local Level: There are more than 8 100 Municipalities (Local Authorities). And some Administrative Units formed of a set of Municipalities.

To solve the harmonisation problem the best solution is to define a Spatial Data Infrastructure at National level (NSDI) as a collaborative project based on cooperation and agreement among different actors: national, regional and local governments, universities, companies, and also individual citizens The way is to open geoportals that publish and shares OGC services and complementary resources. The NSDI Geoportal needs to be a key resource and an effective tool for: to give visibility to all available Spanish SDI implementations; to contribute to the creation of a healthy competitiveness; to stimulate technological innovation on this area showing the new developments in every geoportal or node, as a sort of on-line demonstration and to take advantage of the official corporative image from the main actors at every governmental level. In conclusion, setting up a true GIS on Internet, fully distributed, offering services and functionality based on the interoperability of standardized resources spread out over the Net.

The Spanish NSDI **(www.idee.es)** is a SDI composed of many SDIs. Region and Local Governments need to set up their own regional/local SDI and geoportal giving access to data and service servers at Regional Departments, Local Authorities, Public and Private companies, and Academia at their territories.. At national level some Ministries, public and private companies need also to set up Internet data servers, metadata catalogues, and GI web services.

The National Geographical High Council (*Consejo Superior Geográfico*) is the governmental collegiate body appropriate as Public Authority in Spain to define and set up the NSDI (in Spanish: *IDEE for Infraestructura de Datos Espaciales de España*) and its national Geoportal. This is an advisory collegiate body of the Ministry of Infrastructures and Transports, which technical secretariat is held by National Geographic Institute and whose members are representatives from the three government levels of Spain. It was established by Art. 9 Law 7/86 for Cartography in Spain and its rules are defined by the Royal Decree 1792/1999.

Its members are:

- President: SubSecretary of the Ministry of Infrastructures and Transports
- First VicePresident: Director General of National Geographic Institute
- Second VicePresident: Director of Hydrographic Institute of the Navy
- Representatives from Ministries: Foreign Affaires, Public Administration, Economy & Finances (Cadastre, National Statistical Institute), Environment, Agriculture, Interior (State Civil Defence Office), Defence, Education
- 17 Representatives from every Regional Government
- 2 Representatives from Spanish Federation of Provinces and Municipalities (Local Authorities)

On April 2002 the National Geographical High Council (NGHC) establish the commitment to its Geomatic Commission as Executive Board to define and setting up the NSDI (IDEE).

The Commission on Geomatics is working through a Working Group established on November 2002, and it is reporting and advising to the NGHC. Working Group´s members are technical experts representing NGHC members: geographic data producers, academia and companies dealing with catalogue services and data services. It is open to all relevant actors actually involved in the process and having some activity in this field: data producers, software companies, universities, governmental bodies, up to more than 180 individual members. Its main objective is to develop a Spanish project joining initiatives according to a decentralised and transparent framework, based on data harmonisation and interoperability. The Working Group is developing IDEE under the INSPIRE principles and according its rules. WG IDEE organizes three meetings per year and one technical workshop, and produces recommendations based on electronic revisions and consensus of several items: Minimum services to be implemented in a SDI; Spanish Metadata Core of ISO19115 (NEM); Spanish Model for Gazetteer (MNE) and how to implement WMS. All of them are available at www.idee.es.

The NGHC´s IDEE is funded by the Government of Spain using the National Geographic Institute (IGN-E) budget (State General Budget). The IGN-E has established an agreement with the University of Zaragoza to set up the National Geoportal.

At the National Government the main agencies managing GI production, as IGN-E, Ministry of Environment and Cadastre, are funding their own IDEE nodes or portals. Regional SDIs, and partially IDEE, are funded by Regional Governments. That is the situation at the Regional Governments of Cataluńa, Aragón, La Rioja, Navarra, Basque Country, Cantabria, Asturias, Galicia, Castilla y León, Castilla-La Mancha, Valencia, Murcia, Andalucía and Extremadura. Every day more Local Authorities are developing and funding Local SDIs.

The IDEE Geoportal was opened on 2003 December as a provisional beta version, the first version appeared on July 2004, and the second version with a new interface dated from 2005. Today it is available in 7 languages (Spanish, English, Basque, Galician, Catalan, Portuguese and French) and it implements 8 different OGC specifications (WMS, CSW, Gaz, VMC, WFS, WCS, WCTS and SLD), in a chainable and usable way (Fig. 1).

The main characteristics of the services and application of the Geoportal are:

- The **Gazetteer** service is based on a database of more than 400,000 geonames, and is implemented as a WFS using the Spanish Gazetteer Model (MNE), a conceptual model for geonames defined by WG IDEE, including some key attributes (language, source and etymology), and allowing several names for the same feature.
- The **Map Viewer** access directly to more than 100 services coming from all over Spain offering more than 1000 layers, classified as reference data at the three levels of government (National, Regional and Local), thematic data and other not official data, following the INSPIRE annexes classification (Fig. 2).

- **Catalogue** service allows search and select in a metadata database describing more than 40,000 datasets produced by IGN and the Catalonia Cartographic Institute. We are trying now to organize a distributed catalogue doing harvesting XML files via FTP collection, as a first tentative solution to a distributed catalogue.
- A **Directory of Services** is available showing a captured on-line description from Capabilities information about OGC services available in Spain, and the address to bind them.
- **Data Download:** It's possible to freely download some general and basic reference data in GML format: Administrative Boundaries of Spain at three scales, Geodetic Networks and a Euroglobal, Map Data Base at 1:1,000,000 (Fig. 3).
- There are also two simple examples of **remote analysis**: a Corine-Land Cover analysis utility, based on WFS and offering a statistics about land uses in each municipality; and a DTM analysis application, based on WCS, allowing the calculation of maximum, minimum and average height of an area.
- A set of software tools are available as **freeware**: a simple OGC conformant client application for access WMS and Gazetteer services from PDA; the IGN-CNIG 2D/3D Viewer, a thick OGC client to perform virtual flight over a cartography served as an WMS and using a DTM obtained via WCS; a simple light WMS viewer to be inlaid in a web page.
- Two **Free Software** application: CatMDEdit for metadata capture, multiplatform, with multilingual support, thesaurus facilities, ISO 19115 compliant interface and XML export facilities; and a Toponomy Editor to graphically edit geonames according to MNE and using WMS services.

Figures of usage and statistics of IDEE Geoportal per month:

- More than 30,000 visits.
- More than 5,000,000 individual requests to the services.
- More than 16,000 individual visitors.
- Accesses from 74 countries.
- 25% increment in the last two months.

Generation and processing of high resolution digital orthophotos giving complete periodic coverage for Spain (PNOA)

The National Plan for Aerial Orthophotography is a project proposed by the National Geographic Institute to form and periodically update the coverage of Spain by aerial photography, high resolution digital Orthophotography at 50, 25 and 10 cm resolution, depending on the area, every two years. It also is responsible to obtain a high precision and high resolution Digital Elevation Model, as a whole coordinated by the official bodies and organisations of the National Government and the Regional Governments which currently are generating and/or using this type of cartographic document.

The proposal attempts to be coherent and develop according to the principles surrounding the INSPIRE initiative.

This type of digital orthophotography is, precisely, the type which organisations and official bodies involved in the Project are obtaining, even though in an uncoordinated way.

The coverage must be obtained through collaboration, regulated by the corresponding Agreements, between the Offices and Departments of the Region Governments responsible for orthophotography production, and the Ministry of Infrastructures and Transports, though the National Geographic Institute, and also among the different organisations and official bodies of the National Government who will be the users of these orthophotos.

These Regional Government Offices shall be the official production or contracting bodies of the works for the photogrammetric flight to be carried out, for the creation of the model and for the orthophotography. They must also assume responsibility for the management of the contracts, which will be carried out according to the agreed specifications among all the project participants, and the quality control of the works carried out in their territorial area. The IGN-E carries out the general project coordination, the final quality control step and the integration of the resulting data.

The first implementation of this project is in course and goes from 2004 to 2007. The aim is to obtain photogrammetric flights updated each two years. From them it is generated a digital elevation model and a surface model with 2 m precision in high (rmse) and digital orthophotos with pixel size 50 cm and planimetric precision 1 m (rmse) (Fig. 4).

Financing is shared among National and Regional Governments:

- 66% National Government
- 34% Regional Governments

The second implementation of this project, planned from 2007 to 2010, is more ambitious. The aim is to obtain periodically an important ortho-photo coverage with pixel size 25 cm. The plan also provides for the production of an ortho-photo with pixel size 10 cm for the urban areas.

Production also is going to be decentralised, done by the Regional Governments with the same financial structure.

Developing and loading of the Information System of Land cover/Land use in Spain (SIOSE)

The objective of this project is to produce a land cover/land use database in a cooperative way between the national and the regional administrations with the following characteristics:

- Nominal scale: 1:25.000
- Minimum mapping unit: 1 ha for urban areas and 2 ha for other areas with some exceptions for particular classes of especial interest: humid areas, beaches, riverside vegetation.
- Updating period 5 years (although it is being considered to update urban areas annually)
- Based on images produced by PNT, PNOA
- Common data model:
  - Object oriented (UML description)
  - multiparameter (multiple attributes possible for 1 polygon)
  - multilevel
  - extensible (for particular needs)

The objectives that the SIOSE data model must comply are:

- To satisfy requirements of the participating organisms in SIOSE
- To consider all the necessary land cover/use data minimizing redundancies
- To organize data so that different users can access data in a view according to their needs
- To provide a flexible version of the SIOSE Conceptual Data Model, able of being extended in future.

Taking these objectives into account the design guidelines for the SIOSE data model had been the following:

- Division between Land Cover (biophysical criteria) and Land Use (socioeconomic criteria)
- There is only one geometric entity class in SIOSE (POLYGON)
- Mixed Classes in SIOSE: created by association of singles classes

- Polygon (geometry and topology): must to comply with the Geographical Council specifications (based on ISO19107, ISO19137 standards)
- SIOSE Data model will try to keep CLC nomenclature, as long as it contains all the semantic necessary information for the different users. But Mixed CLC classes will not be kept.
- SIOSE Data model will use enumeration type Classes, with prefixed values that could be modified or extended later
- SIOSE Conceptual Data model: Entity-Relation Data model in UML notation (Unified Modelling Language). It provides normalized notation about classes and relations between them, according to ISO TC211 and Open Gis Consortium recommendations.
- This standardised notation provides flexibility to the model, so that Thematic Working Groups and future users can modify and extend it easily.
- SIOSE Conceptual Data model has considered previous Spanish Land Cover and Use Nomenclatures and Databases, from national and regional institutions (Fig. 5).

Funding of the project is based on:

- 66% National government:
  - IGN (Spanish National Geographical Institute)
  - MMA (Spanish Environmental Ministry)
  - MAPYA (Spanish Agriculture Ministry)
  - MVIV (Spanish Housing Ministry)
  - MEHAC (Spanish Economy and Treasury Ministry)
  - MEDUC (Spanish Education and Science Ministry)
- 34% Regional governments

Conclusions

By mean of the collaborative work among different producers and users of GI in Spain (IDEE, PNOA, SIOSE, etc) IGN-E is obtaining the goals established by its Strategic Plan assuring the availability and reliability of the geographic, geophysical and spatial data for the Spanish State; contributing to the progress of territorial knowledge and to the scientific and technical research in specific areas of Earth Sciences and co-assisting in Spanish social and economic development from its authoritative base.

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Fig. 1. The evolution of the IDEE Geoportal
Rys. 1. Ewolucja geoportalu IDEE

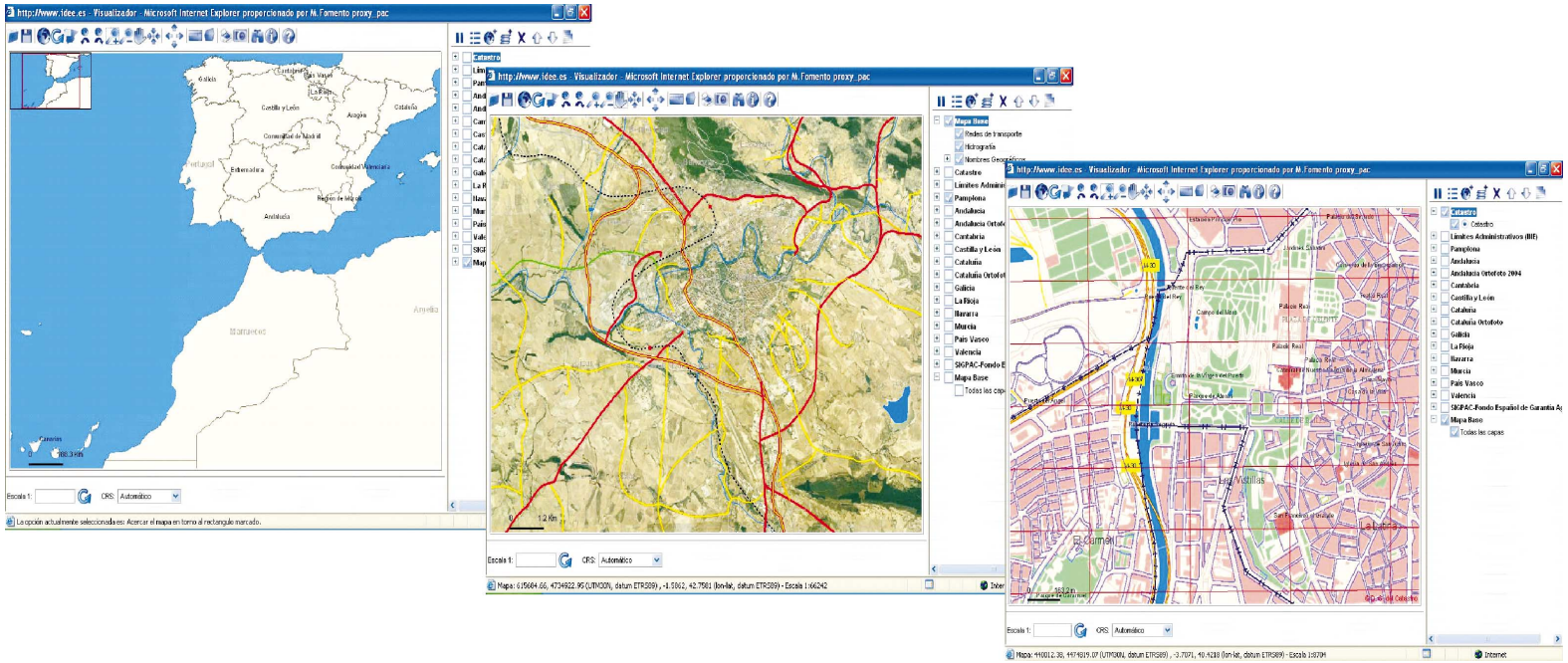

Fig. 2. Examples of Map Viewer
Rys. 2. Przykłady przeglądanch map

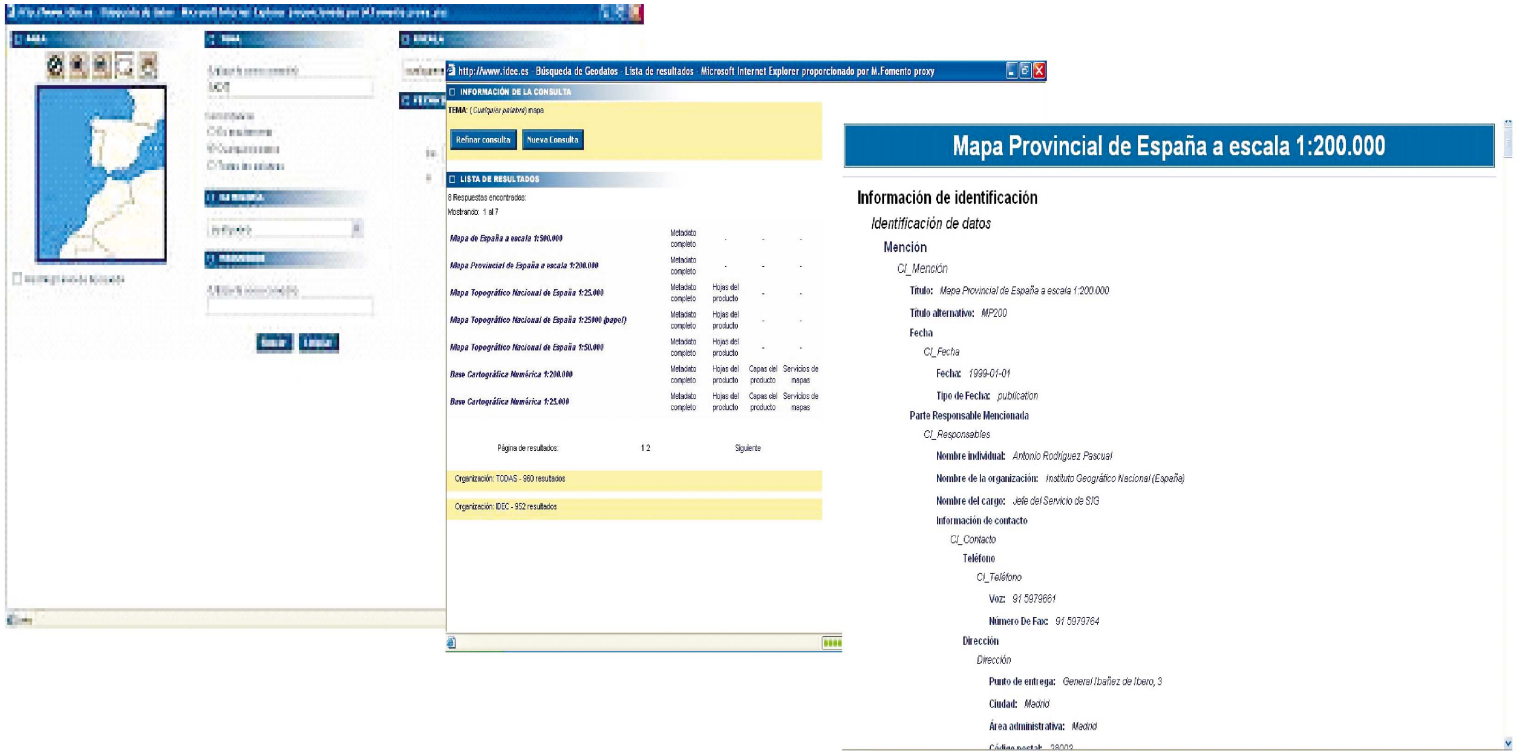

Fig. 3. Examples of Metadata Catalogue
Rys. 3. Przykłady Katalogu Metadanych

Fig. 4. Natural color ortho-photo with 50 cm spatial resolution
Rys. 4. Ortofotografia w naturalnych kolorach z rozdzielczością przestrzenną 50 cm

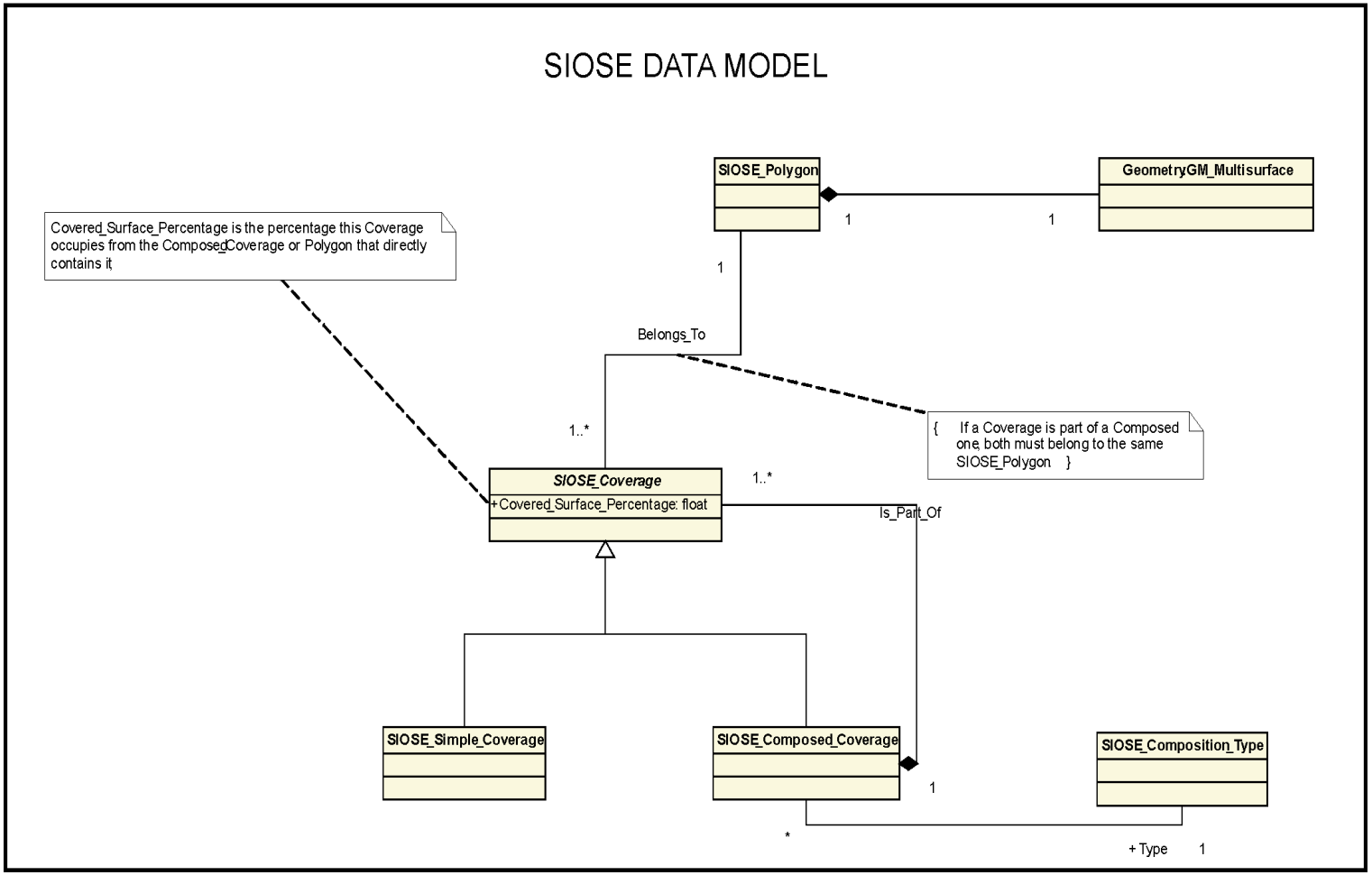

Fig. 5. SIOSE core data model
Rys. 5. Model podstawowych danych SIOSE