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Editor's note: Each institutional report is the respective institution's exclusive responsibility.

FOREWORD

This National Report encompasses the institutional reports of seven Portuguese public bodies responsible for the production and management of official topographic, hydrographic and thematic mapping, providing an overview both of their main activities and of what has been achieved along these past four years.

Society is always in motion, changing constantly and rapidly. New ways of monitoring this process and help decision-makers are therefore necessary. It has become mandatory to produce and disseminate geographical information to organisations and individuals, thus making them a critical piece of the Information Society consolidation process. And, of course, the General Government must also adopt new ways of considering its relationship with the citizens, creating infrastructures and modernising its bodies.

Portugal has a long-standing tradition regarding geographical and cartographic information. Cartography has been seen as a very important way to convey knowledge and a very useful decision-support tool throughout time, not only in the age of discoveries – during which Portuguese cartographers developed their skills –, but also in the subsequent periods up to modern times.

More recently, Portugal has also taken a giant step in Geographical Information towards the Information Society when it was decided to open the National Spatial Data Infrastructure (SNIG) project on the Internet in 1995. In fact, Portugal was one of the first countries to support the development of SDI and pioneered the use of the Internet to implement data dissemination.

Several major GI projects are under way in Portugal, namely the National System for Cadastral Information Exploration and Management (Sinergic), which aims to promote a national cadastral information system in order to guarantee the knowledge of both property and owners and establish single identification of property to be used by the Central Government.

Another important achievement was the publication of the Atlas of Portugal in 2005, which is also available online. It reflects the enormous social and economical transformations, as well as the deep evolution of Portuguese territorial structures.

In today's world it is mandatory to interact with partners. One must cooperate to better achieve objectives. That is why cartographic and cadastral production are increasingly being seen as a joint project between municipalities and the Central Government. Recent cooperation between the Geographical Institute and the Forestry Services has resulted in the production of a national coverage with orthophotomaps at scale 1:10 000 derived from digital aerial photography, updated every two years. Another important result is the elaboration of Forest Fire Risk Cartography with a resolution compatible with the 1:25 000 scale, resulting from the cooperation with Forest Services, National Authority for Civil Protection and the Geographical Institute.

Participation in national and international organisations, like the International Cartographic Association, is not only an important way of cooperating and promoting knowledge exchange, but also crucial to achieve better quality and valuable Geographical Information and make the effort of building Information Society easier.

Lisboa, July 2007

ARMÉNIO CASTANHEIRA , President of the Portuguese Cartographic Council.

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1 – INTRODUCTION

Heir to an institutional tradition that can be traced back to 1788, when the first systematic geodetic works began in Portugal with the purpose of “creating the general triangulation of the Kingdom, aiming both to establish new bases for the theory on the shape of the earth and to be a sound and undisputed basis for the construction of the geographic map of the Kingdom at scale 1:100 000”, IGP is Portugal’s national geodetic, mapping, cadastre and geographic information agency.

IGP’s mission is to act as the national authority in the four fields mentioned above, to produce official geographical information, to develop and coordinate the national geographical information system, to promote training and research in earth sciences and geographical information technologies and to contribute to the information society. It is responsible for the execution of geographical information policies.

In this capacity, IGP is responsible for licensing private companies for cadastral production and for the certification of mapping and cadastre produced by other organisations, with the exception of military and hydrographic cartography.

IGP has a staff of 300, with its head office in Lisboa and six regional offices on mainland Portugal and the autonomous region of the Açores. The former office in the autonomous region of Madeira is under the regional government since 2003.

2 – RESEARCH AND DEVELOPMENT

IGP develops research activities related to the management of geographical information in areas like remote sensing, environment and socio-economic for support problem solving. The main projects that are being developed during this period are the following:

2.1 BEOT

Support for the implementation of a National scheme for the Bases for a director scheme of land use planning for Continent, financed by National Foundation for Science and Technology, in the scope of the program POCTI of the III Communitarian Framework (Project POCTI/ECM/2592/95).

The Project was initiated in 2002 and was finished in 2006, including a study on the systems of planning of France and Germany was made; a proposal of a system of land use planning indicators; and a follow-up process of the work on the management and dissemination of the local geographic information.

2.2 CLC2000

Land Cover (2000) Cartographic Production - CORINE Land Cover for the Portuguese Continent, financed by the European Community.

Funding: European Commission and e the Portuguese Environment Agency;

Objective: Production of cartography of Land Use CORINE Land Cover for the continental territory on the basis of satellite imagery of year 2000.

The Project was initiated in October of 2002 and finished in January 2005.

2.3 [Senses@Watch](#)

Environmental Systems Collaborative Monitoring: Tools and modelling development in order to obtain and analyse environmental data financed by the National Foundation for Science and Technology—in the scope of the III Communitarian Framework (Project POCTI n° 35651/99).

Objectives: to define and to evaluate methodologies to promote the information use on the state of the environment, resultant of voluntary efforts of citizens, including the one that is used in ambient denunciations or the one that are gotten through the human senses, as for example “I smell it”, in the case of the atmospheric pollution. The Project also intends to explore the technologies of information and communication to promote and to support the voluntary ambient management.

In 2005 new developments in the collaborative site had been carried through.

Vide <http://www.igeo.pt/IGEO/portugues/Frameset-projectos.htm>.

2.4 GEOMETA

Minimal geographical elements for environmental and spatial analysis

Funding: National Foundation for Science and Technology, project POCTI/1999/GEO/35129.

Objectives: Conceptual definition and creation and a new type of geographic information, assigned for Minimal Geographical Elements (MGE) and its application to the territorial planning and environment evaluation; conception and implementation of Software tools aiming at to test the possibilities of the MGE in processes of environment evaluation and of space analysis for supporting decisions in local planning.

The Project was initiated in December of 2000 and was concluded in 2004.

2.5 PREMFIRES

Prevention and Mitigation of Fire Hazard

Funding: by the European Spatial Agency and the Portuguese enterprise COTEC.

Objectives: development and test of methodologies for dynamic forest fire risk and dangerously cartography.

The project, which is based upon information available at the “*Rede de Informação de Situações de Emergência*” (Information Network of Emergency Situations), was implemented by a Consortium integrating IGP, Critical Software, SA and the National Public Protection Agency. It was initiated in April, 2004 and finished in December 2005.

2.6 LandWaterMed

Geo-Information for sustainable management of Land and Water resources in the Mediterranean region

Funding: by European Commission.

Objectives: Creation of a platform in which the expertise of the countries of the South and East of the Mediterranean (SEMC) can change information and know-how in geo-information systems for the management of the water and land resources. The main objective is the development of a cooperative process for the SEMC institutions modernization, using the remote sensing and other suitable tools.

The Project was initiated in April of 2002 and it was concluded in 2004.

2.7 CARFOR – Use of IKONOS satellite imagery for covered large scale forestry cartography

Funding: CELPA e MECI (Portuguese enterprises)

Objectives: development and test of methodologies for use of IKONOS satellite imagery for forestry characterization at large scale.

The project was initiated in February of 2005 and finishes in December of 2006.

2.8 LANDEO - User driven land cover characterisation for multi-scale environmental monitoring using multi-sensor earth observation data

Funding: by European Space agency (ESA) and the National Foundation for Science and Technology.
Objective: Development of integrated methodologies to explore given optic and SAR captured by ENVISAT satellite for characterization of the Land.

The project was initiated in November of 2004 and its conclusion is previewed for April 2007.

2.9 AGRO130 - Use of satellite imagery for automatic cartography of cuts and new forest plantations

Funding: by Portuguese Institute of Financing and Support to the Development of Agriculture and Fishing (IFADAP)

Objectives: (1) To show the utility satellite imagery (Landsat and IKONOS) for the automatic production of cartography of cuts and new forest plantations at regional and local scales; (2) To show to the utility of the management of cuts and forest plantations for information capturing (forest inventory, update of cartography) and decision making; and (3) use of the Internet as tool of interaction between producers and users of information.

This project was initiated in September of 2003 and finishes in February 2006.

2.10 BACCHUS – Methodological Approach for vineyard inventory and management

Funding: by European Commission.

Objectives: Development of methodologies for cartography and management of vines based on high-resolution satellite imagery and geographic information systems.

This project was initiated in February 2003 and finishes in July 2005.

2.11 MUBISPI - Spatial Uncertainty: Biodiversity Indicators in the Scope of Physical Planning

Funding: by the National Foundation for Science and Technology – in the scope of the III Communitarian Framework (POCTI/GEO/42351/2001).

Objectives: To define biodiversity indicators for territory planning; to define a test methodology for a methodical evaluation of the data quality and propagation mechanisms of the uncertainty throughout the modelling and the geo-referencing results processes

This project was initiated in March of 2002 and finishes in 2006.

2.12 DISMED - Desertification Information System for supporting a National Action Programs in the Mediterranean

Objectives: To compile/to produce, and later to make information available, that allows evaluating the Desertification processes of, as well as the causes that can originate them. The information must allow: (1) the identification of the factors that influence the process of Desertification; (2) the evaluation of the relative state of the Desertification at national, regional and local; (3) the identification of vulnerable population according to socio-economic parameters.

This project was concluded in 2004, having been produced the Portal of the National Desertification Combat Program. Vide <http://panda.igeo.pt/pancd/>

2.13 ICT - Interfaces and Multi-sensory Communication: Design and Evaluation in Educational Contexts

Funding: by Foundation for Science and Technology.

Coordinator: Department of Computer science of the University of Coimbra.

Objectives: To improve the learning quality in basic school through the use of the information and communication technologies. The promotion of this learning will be based on an interdisciplinary approach for developing basic skills such as the cooperation and the contribution. One of the specific objectives is the creation of *webmapping* multi-sensitive applications at global and local contexts.

The project has initiated in 2005.

2.14 The Use of GIS for Project Environmental Impact Assessment and Strategic Environmental Assessment, in collaboration with University of Strathclyde, Scotland

Description and objectives: For about ten years ago was carried through a study for applying Geographic Information Systems in Evaluation of Environment Impacts, as a result of a contribution by the extinct National Centre of Geographic Information, through the PhD Alexandra Fonseca, and the London School of Economics, through the PhD Elsa João. This new project (2005-2006), carried through for the same investigators, intends to bring up to date the study, concerning projects related to Evaluation of Environment Impacts using GIS applications for Strategy Environment Evaluation. The results of this survey will be able to analyze the effect of new developments in the area of the GIS (e.g. mobile GIS).

In 2005 a new inquiry was send to companies who, in Portugal and in United Kingdom, develop Studies about Environment Impacts. Surprising, the preliminary results seem to indicate that the use of GIS in this domain has diminished, comparatively to its used ten years ago, but it is necessary to collect more data in order to confirm this scenario.

2.15 SDM - Sound Data Mining

Funding: Agency of Innovation

Objectives: To investigate new tools for Space Mining Date that allow: the simultaneous query of geo-referenced and heterogenic databases; the modular application of classification methods, clustering, visualization and hearing; the drawing of intuitive interfaces for multiple platforms, namely the fixed and mobile Internet.

In 2005 tests to the archetype of the SDM had been made; the component of sound was finished associated with the interface for mobile phone; and dissemination activities to the scientific community had been carried, namely through two papers presented in "GIS PLANET 2005" Conference.

2.16 EFICP - European Forest Information Communication Platform

In consortium with EDISOFT, a Portuguese public company, and the French organism "*Générale d'Infographie (GI)*", the IGP goes to collaborate in the conception and development of a platform for Communication and Information of the European Forest (EFICP - European Forest Information Communication Platform). The Joint Research Centre of the European Union evicted this work, in December of 2005.

Funding: the Joint Research Centre of the European Union

The project is running according to the schedule planning (2006-2007).

2.17 HUMBOLDT - Data Harmonization and Service Integration according to INSPIRE EU directive

In consortium with 27 European entities by the Humboldt University leadership the IGP is involved in this international project, financed by the Joint Research Centre of the European Union.

The main objective is to define and implement Data Harmonization and Service Integration according to INSPIRE EU directive.

The project is running according to the schedule planning (2006-2009).

2.18 SIG@M – Local Geographic Information

In order to define the structure of an Internet site for systemizing the access to the existing services of local geographic information in Portugal Continental (mainland) was developed the project “SIG@M - the Local Geographic Information”. The Project was concluded in 2006.

2.19 Quality

IGP is, at the moment, implementing a system of quality management, according to ISO 9001:2000, with the objective to obtain the certification.

Data quality and standards are under study, and gradually being implemented at a national level. At European level, through EuroGeographics, a network of experts has been created, in order to discuss and promote experiences on data quality in geographical information field and quality management. A common specifications for reference data within Europe, regarding the European spatial data infrastructure are being implemented.

3 – EDUCATION AND TRAINING

Vocational education at a technical level in the field of Geographical Sciences has been a tradition of the several public bodies which preceded the present-day Instituto Geográfico Português (IGP). The first steps were the legislation published in 1833 and 1836, which committed the famous geodesist Filipe Folque to the task of organising a course in Geodesy in order to prepare the military officers involved in Geodetic work in Portugal.

Similarly, emerging from the need to prepare technicians to carry out the tasks committed to the mission of the then called IGC, a professional school was created in the early 1980s. Its main aim was to ensure the vocational education of the Institute's technical staff, namely in the field of Land Surveying, Cartography and Photogrammetry. Initially, courses focused mainly on practical aspects, but they were framed within the Portuguese Vocational and Technical Education System following remodelling in 1983.

Under a new legal framework – and keeping in mind the demands of this level of education not covered by the former system – the school became part of the Public Education Network, giving birth to the present Escola Profissional de Ciências Geográficas (EPCG).

3. 1 – Escola Profissional de Ciências Geográficas (EPCG)

EPCG was created in September 2000, is a public school jointly administrated by the Ministry for Education and the Ministry for Environment, Land Management and Regional Development, and is located in the IGP building. EPCG has a long experience and training expertise in this field, benefiting from its links to IGP, namely as far as its technical staff is concerned.

EPCG's main target is to create, organise, promote and offer courses aiming at the education, training and updating of professional technicians in the field of Planning and Land Management, Environment and Social Infrastructures, supporting the activities of Land Surveying, Mapping and GIS / LIS.

At present, EPCG provides initial education through the following professional/vocational courses:

- a) Surveyor (Technician);
- b) Cartographic Technician, which involves two streams or specialisation:
 - b1) - Cartographer (Technician);
 - b2) – Photogrammetric Technician;
- c) Geographical Information Systems (GIS) Technician.

These courses award Level 3 vocational qualification. They are secondary-level education courses and award diplomas equivalent to those awarded by regular secondary schools, thus enabling pupils to continue to higher education. The school has students from all the country, especial from the south part and Autonomous Regions of Azores and Madeira.

Special short-term updating training courses in the field of Geosciences (GPS, Cartography, GIS and CAD) designed for technicians from other public bodies have also been organised.

We hope to continue developing training programmes on new methodologies and digital technologies in Cartography and Cadastre, helping Local Government staff and other technicians who want to develop special skills or simply update their knowledge.

4 – PRODUCTION

4.1 GPS Permanent Stations Network (ReNep)

IGP has a total of eight GPS Zero Level Permanent Reference Stations, in mainland, Madeira and Açores Archipelagos. Four of those stations belong to the Portuguese EUREF Permanent GPS network (EPN): GAIA, CASC, LAGO, PDEL and one in Madeira island, FUNC, and, one of them, PDEL located in Ponta Delgada (Açores), is also an IGS station (International GPS Services).

By the end of the year 2006, the IGP change all the ISDN network to ADSL-supported Internet communications, providing, as well as daily and hourly RINEX data files, also broadcast real time corrections, under NTRIP Protocol.

In order to establish a new national geo-spatial reference system, the IGP is working on a project for the implementation of a GNSS Continuous Network. To fulfill that goal, in Portugal mainland, it will be set a total of 9 zero level GNSS permanent stations, adding "Guarda", on the North East, "Santiago do Cacém" and "Borba" on the south and relocating the station from "Beja" to "Mértola". The zero level order stations have choke-ring antennas with absolute calibration, very well monumented on stable sites. Those stations also have meteorological sensors. This project will include 30 more new level one stations in mainland, and 4 new stations in Açores and Madeira Archipelagos, in order to have a full coverage of a permanent RTK network.

The IGP policy is to provide free access data for all users, and support the communications expenses of those stations. Regarding this goal, last year the IGP invited other organizations, private and public, universities, etc, to join the Portuguese RENEP network. By the end of June 2007, IGP more 4 level one GPS Permanent stations have been installed at Bragança, Castelo Branco, Albergaria dos Doze, Lisbon - IGP and Tavira.

4.2 Geoid Model - GPS on Levelling Bench Marks

In a joint project of IGP, FCUL (Faculdade de Ciências da Universidade de Lisboa) and the Instituto de Astronomía y Geodesia de la Universidad Complutense de Madrid (Spain), a new gravimetric geoid model was developed. The first results were presented at the 3rd Hispano-Portuguese Assembly of Geodesy and Geophysics, held in Spain in 2002.

By the end of 2006, it were coordinated with GPS about 80 bench marks, connecting the measurements simultaneously with two geodetic points (1st or 2nd order). These measurements contributed to adjust and validate the gravimetric geoid model and were also included to the EUVN - DA project.

4.3 Gravimetric Network

The gravimetric network of Portugal mainland, consists of more than 6500 points, measured with LaCoste & Romberg relative gravimeters, and has a density of about one point per 25 km². In 1994 Dr. J. Mäkinen of the Finnish Geodetic Institute (FGI) had determined the absolute value of gravity in Gaia and Mértola, with the JILAg-5 absolute gravity meter.

In 2003 Dr. Mäkinen came again to Portugal to perform an absolute gravity survey, this time with FGI's new FG5 #221 absolute gravimeter. The Gaia and Mértola stations were re-measured, and a new point was measured in Cascais, in the same building of the GPS permanent station and near the tide gauge.

4.4 Vertical Deflection Points' Network

A network of about 130 vertical deflection points' was observed with a prismatic astrolabe and a Wild T4 theodolite until mid 1980s.

In 1998 a project for the re-observation and densification of this network was started in a co-operation with ETH-Zürich (Swiss Federal Institute of Technology Zurich). The first work was the re-observation of 25 stations with the Zenithal Camera of ETH-Zürich. In the subsequent year another 28 points were observed with the ICARUS automatic system.

In 2000, following a protocol between IGP and FCUL, a special densification campaign along the central part of Portugal was launched. During this campaign the ICARUS system has been put in operation together with a GPS Palissade receiver, for timing purposes. In the year 2001 another 11 stations were observed.

In 2004 in field campaign performed by Dr. Beat Bürki and Dr. Anna Müller of ETH in cooperation with IGP, 17 points were measured with the new digital Zenith Camera system DIADEM.

4.5 Tide Gauges

IGP is responsible for two floating tide gauges, at Cascais and Lagos, working since 1882 and 1908, respectively. The Cascais tide gauge is the reference for the mainland ordnance datum.

In 2003, due to the technological innovations and for a better service to the scientific community, IGP acquired 2 new acoustic tide gauges, in order to replace the floating tide gauges systems. These new systems will work simultaneously with the older ones for at least two years. In that way we assure a better quality of the data and also the continuity of the secular series.

4.6 Geodetic Network - Mainland (ETRS89 Co-ordinates)

By the end of the year of 2004, the observation with GPS of the first and second order networks, in Portugal mainland, was completed. As in Mainland there are about 7000 3rd order geodetic points, that were impossible to observe in a short period in time, to obtain ETRS89 co-ordinates, it was used a co-ordinate transformation method from the Portuguese mainland local system (Datum 73) to ETRS89. This method is less accurate but good enough for most practical applications.

For that purpose, it has been tested different methods of transformation. The first order (119 points) was used to determine the transformation parameters, and the 2nd order network (833 points) was used to evaluate the accuracy of several transformation methods. The chosen method was Bursa-Wolf parameters plus a local interpolation based on its residuals, and, in the end both the first and the second order networks were used to transform the points of the third order.

4.7 Geodetic Network - Madeira Archipelago (ITRF 93 Co-ordinates)

The Geodetic network of Porto Santo island, in Madeira Archipelago, was measured with GPS during October 2004. A total of twenty monumental geodetic points defines the Porto Santo network. This field campaign also includes the realization of reciprocals and simultaneous zenithal observations to improve precision in the height. The preliminary computation shows results (for ITRF93) better than 2 centimeters (at 95% of confidence level) for the coordinates. Local Datum (Base SE) coordinates were also computed, using the same set of observations. The Geodetic Network has already been adjusted for Base SE coordinates, with the same precision as the ITRF93 coordinates.

4.8 Geodetic Network - Açores Archipelago (ITRF 93 Co-ordinates)

The Geodetic network of Corvo and Flores islands, in Açores Archipelago, was measured with GPS during July 2005. A total of six monumental geodetic points defines the Corvo network and a total of thirty tree monumental geodetic points defines the Flores network. The preliminary computation shows results (for ITRF93) better than 4 centimeters in Corvo and 2 centimeters for the coordinates of Flores (at 95% of confidence level). Local Datum (Observatório) coordinates were also computed, using the same set of observations.

4.9 Large scale mapping

For the purpose of large scale topographic maps and orthophotomaps production and updating, IGP is being established partnerships with regional and local public authorities. The scales involved are 1:10 000 and 1:2 000 or 1:1 000.

As National Authority, the Portuguese Geographical Institute will ratificate this cartography, and the 1:10 000 sheets will integrate the National Topographic Map Series 1:10 000.

4.10 National Topographic Map Series 1:10 000

This map series was designed from the outset to be produced in digital form and to integrate GIS. It is base on a comprehensive object catalogue and multi-cod system

IGP coordinates and verifies all the activities related with the production of this map series (see 4.8). At the moment 59% of the area of Continental Portugal is covered by this series and the data is available to users.

4.11 National Orthophotomap coverage

IGP produces a full coverage with orthophotomaps of Portugal Mainland with a 50 cm GSD, using digital aerial photography obtained with the UltraCam Vexcel camera.

4.12 National Topographic Map Series 1:50 000

Update and vectorization are in progress. Since 2002, the reference system changed from Bessel_Bonne to ETRS89/Mercator Transverse. A folded printed version was also introduced.

4.13 Topographic Map of Continental Portugal 1:500 000

This map is updated every year since 1998. A folded printed version was also introduced in 2002.

4.14 EuroGlobalMap

The first version, elaborated in accordance with EuroGeographics, was finished in 2003

4.15 EuroRegionalMap

Portugal participates on this project, an European map at scale 1:250 000, trough EuroGeographics.

4.16 Systematic Aerial Photographic Coverage

Since 2004, IGP has a systematic coverage of the Continental territory, using a digital camera. The images have a radiometric resolution of 16 bits and a spatial resolution of 50 cm on the ground. This coverage is to be done with a two years gap.

4.17 Administrative Map

Administrative boundaries surveying is under way. This information and other derived from existing maps, integrates the Euro Boundary Map of Europe compiled from source data provided by 37 National Mapping Organizations.

4.18 Cadastre

A pilot test in the region of Albergaria dos Doze is under way, regarding the implementation of the National System for Exploration and Management of Cadastral Information (Sinergic). The goals of this system are: Join in one system all cadastral data; On-line cadastral information and use of e-government procedures; Guarantee the multifunctionality and interoperability between partners and their databases; Integrate in the real property registry cadastral information; Guarantee the privacy and security of data; Equal access to information for all owners.

Rural cadastre maintenance and digital conversion is on way.

4.19 Information and library

The Library is responsible for the preservation, maintenance, diffusion and reproduction of ancient maps and other IGP publications and also responsible for management of the scientific and technical information available in the area of geographical sciences. It includes a specialized Library and a Map Library.

The purpose of Library is to make the Institute's scientific and cultural heritage accessible, and to bring the collections to everyone's knowledge. A digital data base on IGP historical map collection is being created, as well a digital data base on IGP available products, comprising both image and metadata description, enabling search and order through the Internet.

(<http://www.igeo.pt/IGEO/portugues/servicos/Biblioteca.htm> / e-mail: cdi@igeo.pt).

4.20 National Spatial Information Infrastructure (NSDI)

Concerning the National Spatial Information Infrastructure, the “*Sistema Nacional de Informação Geográfica*” (SNIG), which has been organizing in compliance with normative and the objectives of INSPIRE (Infrastructure for Spatial Information in Europe), has developed the following main activities:

4.20.1 NSDI Reorganization according to the international standards

In 2006 had been conceived a conceptual model for the reorganization of the NSDI. This model was produced according to the recent international standards and requirements of the INSPIRE directive, International Standardization Organization (ISO) and Open Geospatial Consortium (OGC). At a moment the IGP is preparing the NSDI geo-portal based on this model.

4.20.2 Development and reinforcement of thematic services

a) CRIF – Fire Forestry Risk Cartography

Facing to the positive results of the methodology validation concerning the Risk Map of Viseu district produced in 2004, the IGP has promoted its extension to the other districts of the Continent, in partnership with DGRF (Nation Forestry Agency) and ANPC (Nacional Civil Protection Agency).

In 2006 were covered five districts with this thematic cartography (about 35% of the mainland). The project is running according to the schedule planning (2006-2008).

Vide <http://scrif.igeo.pt/>

b) DEMETER – Remote Sensing Thematic Network

After an agreement with EURIMAGE, representative of LANDSAT satellite imagery, in 23 of June of 2005, an interface in the SNIG (the NSDI) Internet portal for consultation and order of images by the entities that integrate the DEMETER. Vide <http://www.igeo.pt/demeter/>

c) Public Urban Equipment Information System

The IGP integrated a work group that developed, in 2006, a study for the conception and construction of a internet platform aiming the Urban Equipment management.

d) Land Use Cartography

The Institute is working on a production of a multi-scale cartography of Land Use, based on satellite imagery and semi-automatic methodologies. This project was initiated with the constitution of a Comity who integrate, on the other hand, the potential cartography users and, on the other hand, the responsible institutions for production of thematic cartography that can come to be useful to project.

The IGP has also prepared an international tender for a Land Use Map production at a medium scale (1:25.000).

e) FÓRUM-SNIG

As NSDI coordinator the IGP has promoted (2005) the launching of the FÓRUM-SNIG (<http://www.igeo.pt/forum/>) aiming ideas interchange and discuss in the context of the activities and interests of the geographic community.

4.20.3 MIG – Geographic Information Metadata

Concerning the available services in the “*Metadados de Informação Geográfica (MIG)*” (Geographic Information Metadata) domain, it was development the following activities:

- An application for editing and publishing Geographic Information Metadata, according to the ISO 9115 standard and in accordance with the recommendations of the work group that was developing the ISO 19139.
- An application for HTML MIG Visualization.
- MIG training for the NSDI entities.

4.20.4 Atlas of Portugal

The project “Atlas de Portugal”, initiated in 2003 with European Commission support, was finished in 2006. An electronic version is available in Internet site:

<http://62.48.187.117/atlas/index1.asp>.

5 – PUBLICATIONS

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1 – INTRODUCTION

The Instituto Geográfico do Exército (IGeoE) (The Army Geographic Institute) was created on 1 July 1993 upon order 72/MDN/93 of the Ministry of Defence, and is the natural heir to the longstanding Portuguese military cartographic traditions from the Serviço Cartográfico do Exército (SCE) created in 1932. IGeoE is the organism responsible for the production of Military cartography under the aegis of the Logistic Command.

The Institute's mission are divided into two areas:

- **National Defense**

Respond to army needs and support all the other branches of the ARMED FORCES with cartographic documentation and information (including all the commitments with NATO policies).

- **Civilian Support**

Provide cartographic documentation and information, as well as co-operation in public projects.

2 – RESEARCH AND DEVELOPMENT

Since 1987 the IGeoE has been presenting projects geared to the conversion of the production line from traditional analogue methods to digital production, while simultaneously keeping pace with scientific forefront of national cartography. Thus since 1995, IGeoE has been developing fourteen projects, which, whilst independent, share the same goals: the use of digital processes in cartographic production, and access digital information (database) for scientific studies.

2.1 The Geographical Digital Database – start in 1988

Corresponds to a topo-cartographic database pertaining to all cartographic produced by IGeoE, and the necessary means for its elaboration irrespective of whether this implies updating existing cartography or converting reproduction elements obtained by conventional methods.

2.2 Satellite Data in Small Scale Map Revision – start in 1990

Involves all the necessary means for satellite image processing with a view to updating cartography and obtaining orthoimages.

2.3 Global Positioning System – start in 1992

A set of means for the reception and processing of satellite signals leading to the obtention of tridimensional co-ordinates of topographic ground control points.

2.4 Military Geographic Information System – start in 1994

Will permit a more dynamic use of digital cartographic information by establishing interactive links with other non-cartographic information, thus producing a more realistic characterization of the said representation. Other military projects under the scope of the Geographic Information System will also be supported.

2.5 Digital Terrain Model – start in 1994

Includes the means necessary for building in automatic digital terrain model from digitized aerial photographs and the production of orthophoto maps. At the moment Digital Terrain Model is in the continuous updating process and acquired by correlation.

2.6 Map Revision – start in 1995

Consolidates the material resources necessary to render the remaining projects viable and efficient with the purpose of accomplishing the goal of a complete digital cartography of Portugal at a 1/25 000 scale by the year 2004.

The project's conclusion was postponed due to several reduction budget.

2.7 Digital Orthophotomaps – start in 1996

This project is part of a protocol signed with the NGIC with the objective of carrying out the orthorectification of 4 500 photographs, of false colour areas. This involves the total coverage of Portuguese continental territory. The images have the following characteristics:

- Pixel: 1 meter;
- Control points: obtained from the 1/25 000 cartography;
- DTM: 1/25 000.

2.8 Census 2001 – start in 1997

This project had began with a protocol signed with the National Institute of Statistics, aimed to provide cartographic support of the 2001 Census. In this project was involved more than 30 people, 25 workstations and 10 A0 plotters.

2.9 VMAP (Vector Smart Map) – start in 1996

This project involves several NATO countries in the field of Geographic Information Systems. The objective of this project is to produce digital cartography data of the terrestrial globe on a scale 1/250 000, linked to a non-graphical database.

The IGeoE is updating the areas of Portuguese territory.

2.10 CNEFF – start in 2002

This project has began with a protocol signed with the “Comissão Nacional Especializada em Fogos Florestais (CNEFF)”. The aim of the project is to provide cartography on both scales 1/50 000 and 1/100 000, based on satellite images in order to prevent and combat fire forestry.

2.11 SERVIR PROJECT– start in 2006

In April 2006 IGeoE establish the first phase of SERVIR project. It is a project that seeks to establish a network of reference stations GPS (Global Positioning System) for positioning in real time. This project is expected to be implemented in 3 different phases for different areas of Portugal (excluding Madeira and Azores).

The system is mainly constituted by 3 main components: a group of GPS reference stations located accurately along the National Territory, a reliable communications system and a calculation center (monitoring and control of the whole system).

Basically the system allows the user to establish a connection with the calculation center (by WEB, GSM, GPRS or broadcasting radio), which, after having processed the GPS data, it makes available the applicable differential corrections to the area where it aims to execute the work. It is a concept

apparently simple. It is based on the principle that the errors that affect the GPS receivers (these are inside the network) are "calculated by the system", according to the errors obtained in the involving/involved stations, allowing to calculate the corrections for the approximate position of ER - Rover". Supposing one is able to achieve those corrections in "real time" in the GPS receivers (connected to the system) then we will also be able to get in "almost real" time the corrected and accurate coordinates of any point in the field (located inside this network).

2.12 MGCP PROJECT– start in 2006

The Multinational Geospatial Co-production Program (MGCP) is a coalition of nations participating in production of global high-resolution vector geospatial data. All MGCP data co-producers will populate the International Geospatial Warehouse (IGW) for storage, exchange and use of geospatial information. The IGW will be established and maintained by the United States National Geospatial-Intelligence Agency (NGA).

The vector geospatial data stored in the IGW will be organized in 1x1 degree cells as produced by MGCP Participants. The geospatial data contained in these cells will be published using the Environmental Systems Research Institute, Inc. (ESRI) Shapefile format. The features composing the cell geospatial data handle a full set metadata fields.

The Army Geographic Institute (IGeoE) was charged with the carrying out of MGCP Project concerning the production area settled for Portugal. The production areas are: Cabo Verde Archipelago, São Tomé e Príncipe Archipelago, an area in Angola and Continental and Insular Portugal, with a total of 53 cells.

The project represents the most current evolution of a 10-year, global vector-map level 1 (VMAP1) effort that began in 1993 and was revamped in 2003.

2.13 The Aeronautical chart PROJECT– start in 2006

The aeronautical chart project at 1/500K scale was born because of the need from National Institute of Civil Aviation (NICA), to update his georeferenced aeronautical information.

This project involves the production of an aeronautical chart based on ICAO (International Civil Aviation Organization) rules, with the characteristics as follows:

- One sheet covering continental land;
- Datum WGS84;
- Lambert Conformal Conic projection;

The aeronautical layer was given by Aerial Navigation of Portugal (ANP) and includes:

- Aerodromes and heliports;
- Radio helps;
- Controlled aerial space;
- Obstacles to aerial navigation;
- Eolic parks.

This information is put over the topographical layer at 1/500K scale of the Geographic Institute of Portuguese Army, which is manipulated in order to make possible to have distinction of this aeronautical layer.

2.14 Portuguese Cartographic Series PROJECT– start in 2006

Started in October 2006, the Portuguese Cartographic Series project is the result of a partnership between the Geographic Institute of the Portuguese Army and the Department of Geographic Studies (Lisbon University).

A data base which associates all the raster images of the different map sheets series available to a bibliographic descriptions and new technological retrieval ways for the cartographic information are the expected result. A trial version of the data base is now available at web page of the Institute

3 – EDUCATION AND TRAINING

The IGeoE educational program offers 5 courses in different areas:

- **Digital Cartography Course (DCC)** – This course has duration of four months in a theoretical-practical base, in order to prepare the student with the capabilities to process, edit, validate and print vectorial georeferenced geographic information.
- **Photogrammetry Course (PC)** - This course has duration of four months in a theoretical-practical base, in order to prepare the student with the capabilities to vectorize and acquire points, polygons and lines from information based on imagery, accordingly with requisites.
- **Topography Course (TC)** - This course has duration of four months in a theoretical-practical base, in order to prepare the student with the capabilities that gives him the capacity, when in field operations, to obtain numerical data for topographic support, as well to do the geometrical validation of the data acquired by comparison with the reality.
- **PCMAP Course** – This course has duration of one week. It is a tool for decision support of military operations, for instance tactical analysis of the terrain during planning phase, based on a digital cartographic system with tools for manipulation and data analysis.
- **Image Interpretation Course (IIC)** – This course has duration of one semester, with the aim to give to the Portuguese Armed Forces elements with the ability to analyze and interpretate, in order to obtain valid and useful information, based on imagery and additional information that can help the commanders in the operational decision process.

4 – PRODUCTION

4.1 Geographic Database

Data acquisition using digital stereo-plotters and colour aerial photographs digitized.

4.1.1 Series 1/25 000

Amongst the nine cartographic series on Continental and Insular Portugal for which IGeoE is responsible, the Military Map of Portugal at 1/25 000 scale (series M888, M889 and P821) is the most well known within the community.

4.1.2 Series 1/50 000

Automatic and semi-automatic generation of the Geographical Database features.

4.1.3 Series 1/250 000

Up-to-date maps using satellite imagery.

4.1.4 Series 1/500 000

Up-to-date maps using satellite imagery.

4.1.5 Military Applications

- Orthophotos
- DTM
- Slopes maps
- Interdiction and Restriction Areas
- Visibility and Non-Visibility Areas
- Other Themathic maps

5 – PUBLICATIONS

5.1 Manual on Photographic Interpretation

This manual is an adapted translation of the TM 30-245 (USA), published in 1954. It is geared to educational purposes as a study aid for participants in the Image Interpretation Courses taught at IGeoE attended by military staff from the three branches of the Armed Forces. In addition to basic theory on reading and interpreting aerial photographs, it also covers other areas such as:

- Techniques of measurement;
- Reading and Interpretation;
- Interpretation Reports;
- Maps Projection Systems;
- Referencing Systems;
- Photomaps and Mosaics.

5.2 Manual on Maps Reading

The main aim of this manual is to help the user to obtain the maximum information and benefit possible from any cartographic document.

It is a guide for every user of topographic maps containing general instructions on:

- Marginal information;
- Grids;
- Scales;
- Size/Dimensions;
- Relief;
- Bearing and direction assessment;
- Maps and relief-maps;
- Aerial photographs;
- Mosaics;
- Photomaps.

5.3 Gazetteers

These consist of an alphabetic list of the current toponyms used in the different series of maps published by IGeoE and other organisms. The toponyms present in the specific case of the gazetteer on Continental and Insular Portuguese territory, refer those contained in editions of the 1/25 000 Military Map of Portugal.

Each publication includes the following information:

- 1st column - toponyms
- 2nd column - abbreviations
- 3rd column - GAUSS coordinates (M)
- 4th column - GAUSS coordinates (P)
- 5th column - referencing code of territory
- 6th column - identification code of the cartographic document
- 7th column - sheet number and respective series

5.4 Manual for the Auxiliary Surveyor

This publication is intended for educational study and is a complement to the Topographic Courses taught at IGeoE. It can also be regarded as an aid for the surveyor, in that it covers not only basic concepts but also rather complex ones. It deals with subjects such as algebra, decimal logarithms and trigonometry. It focuses on the depiction of Earth's surface, the tools used in field work and also on the various methods of topographic survey used by the IGeoE.

5.5 Referencing Systems

This publication contains information describing the fundamental principles upon which military referencing systems are used.

5.6 Complementary Data to the 1/250 000 scale Military Map of Portugal – series M586

This series represents an attempt to logically and coherently produce sets of information which cannot be portrayed on the map but are a fundamental tool for any spatial operation to which they refer. Data on physical, demographic, social, economic and transportation was collected from a varied bibliographical selection. The IGeoE is well aware that the work carried out is not as yet a complete one. However the hope is that an important contribution to Military Geographic Information has been made.

5.7 General Notions of Geodesy

This publication is intended to systematize and standardize a set of terms in the field of geodesy and which are deemed as being of the utmost importance for the basic training provided in the Cartographic Courses taught in IGeoE.

5.8 Complements of Topography

This publication is intended to systematize and standardize a set of terms in the field of topography and serves for educational study.

5.9 Routes Map of Continental Portugal, in Scale 1/250 000

This publication contains the same cartographic information as the series M586. The format and the size of this book allows an easy and quick view of main roads.

5.10 Papers

Afonso, António; Dias, Rui; Teodoro, Rui (2006); "IGeoE: Positional Quality Control with different RTK positioning methods", ACCURACY 2006 - 7th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences, 5 a 7 de Julho de 2006, Lisboa ;

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1. INTRODUCTION

According to the Portuguese law the main mission of the *Instituto Hidrográfico* (IHPT) is:

- “The execution of the cartography of the internal and territorial waters and other waters of national interest (...);”
- “National Authority for the publication of nautical charts and nautical publications (...);”
- “To conduct activities related with marine science and technology (...).”

2. RESEARCH AND DEVELOPMENT

2.1 Paper Charts Production

The paper nautical chart (NC) production in the IHPT is entirely done using a Computer Assisted Cartography system (CAC), since mid 2004. All charts are stored in digital files, which are also used for Electronic Navigational Charts (ENC) production.

2.2 Computer Assisted Cartography System

The CAC used in the Paper Chart production is based on CARIS GIS. Some topographic data processing and import/export is also done using AutoCAD MAP. Developments using several CARIS modules were done, for instance the automatic chart correction and several scripts for Quality Control (QC) and spatial data assimilation, using mainly Visual Basic, C and TCL/TK programming languages.

The most important development in the last years was the whole migration from UNIX to WINDOWS workstations, running new versions of CARIS GIS.

2.3 Paper Chart Updates

To respond to the demand of chart update, the IHPT maintains a program of enhancements of the chart updating software developed by IHPT for HP-UX operating system, and a new version for Windows is being developed at the present time.

2.4 Computer Assisted Cartography System

To store and manage all bathymetric data and respective metadata, IHPT developed its own Hydrographic Data Warehouse (HDW). The HDW was developed in-house, according to the IHPT specific needs. The main advantages of this system are its capability to store, manage, handle, and select the bathymetric data and respective metadata either for nautical chart production or on request for internal or external users.

The HDW is considered to be a fundamental tool for the hydrography modernization at IHPT. An effort has been made to transfer the analogue survey sheets data to digital format, to have all the collected information ready to be assessed online or near-online.

2.5 Print on Demand

Since 2005 the IHPT prints the nautical paper charts on demand using a large format ink jet plotter. Print the Paper Charts on demand was the direction found by the IHPT to surpass some of the problems and the high expenses to maintain and to operate both the conventional lithographic offset and the electrostatic plotter for the reproduced material.

2.6 Hydrographic Production Database

To improve the efficiency of the cartographic production, in 2005 the IHPT began the implementation of a new system to manage the cartographic data and produce the two different kinds of navigational cartographic products, the Nautical Charts (NC) and the Electronic Navigational Charts (ENC).

This system called Hydrographic Production Database (CARIS HPD), is composed by a set of applications implemented over a Spatial Database and Management System (SDBMS). While the SDBMS (Oracle Spatial) stores and manages the cartographic data and the produced products, the system of specific applications connect to the database and implement the system explicit functionalities which ranges from data loading to the products creation.

With CARIS HPD each representation of a real world object just needs to be stored once into the database and one system using only one data set can produce all the range of IHPT cartographic products, simplifying significantly the production, the data creation and the updating processes.

Nowadays, most of the ENC published and data from some NC had been already loaded into the HPD database and two NC and one ENC are being produced.

3. EDUCATION AND TRAINING

During the report's period the IHPT organized several training courses with the following tools of the CARIS software:

- CARIS LAW OF THE SEA (LOTS)
- CARIS HIPS/SIPS
- CARIS HPD Administration Tools
- CARIS HPD Source Editor
- CARIS HPD ENC Editor
- CARIS HPD Paper Chart Editor

And some training with other vendor tools which IHPT uses for some conversion purposes:

- ARC GIS
- ARC MAP
- ARC CATALOG
- ARC GIS 3D ANALYST

4. PRODUCTION

In the context of Nautical Charts production from the Portuguese responsibility areas, production programs were created as follows:

- **New Charts:** The aim of this program is to cover, with New Charts, in different scales, all maritime areas of national responsibility, and other areas where Portugal has assumed international commitments in the context of the International Hydrographic Organization (IHO).
- **New Editions:** The aim of this program is to ensure the coverage of the maritime areas of national interest and responsibility with updated editions of charts previously published.

The IHPT produces nautical charts both in paper form and Electronic form (S-57).

Aiming the stated above, IHPT organizes its charts portfolio as follows:

- **Small scale** charts are provided for passage planning and for navigation out of sight of land. These charts are typically in scales from 1: 1 million to 1: 3,5 million;
- **Medium scale** charts (coastal chart series) are provided for passage along the coast. These charts are typically in scales from 1: 350 000 to 1: 150 000;

- **Large scale** charts are provided for harbour approaches, ports and inner waters. These charts are typically in scales greater than 1: 30 000.

The current nautical chart portfolio (56 charts) was planned taking into consideration that: the number of charts should be as minimal as possible; the safeguarding of navigation safety principles; and, the requisites of the International Hydrographic Organization (IHO).

Beyond the production of a nautical chart portfolio, IHPT had also developed two other portfolios, one for recreational and other for fishery navigation. Both the recreational and fisheries charts are based on the medium scale nautical charts (in the scale 1: 150 000 and A0 size). They have the base information from the corresponding nautical chart and meet the IHO specifications for nautical charts.

4.1 Paper Charts

Production of nautical and thematic charts in the IHPT is carried out by modern computerized graphic methods. A vector system using CARIS GIS software is combined with a raster-based system.

The raster system used at IHPT is a SCITEX 280 System. A high scanner is used for black and white line originals. The scanned files are transformed into vector format using CARIS SAMI software. After the information has been vectorized, it is transferred into the CARIS software for concatenation of lines, symbols and text to get their final shape, and to have the areas with correct colours and patterns. All colours, patterns, text fonts, lines and symbols are stored in a master file library. The vector information can be imported from external map systems.

4.2 Electronic Charts

4.2.1 ENC Production Plan

The strategic plan of ENC production was established with the purpose of satisfying, in a faster way, the needs of the maritime navigation in the whole extension of the Portuguese coast. In this way, maximum priority was given to the production of coastal ENC (compilation scale between 90 000 and 349 999). When the coastal waters coverage was concluded the ENC production proceeded with the coverage of the main harbors (Lisboa, Leixões, Setúbal and Sines). Following this and considering the importance of the maritime transportation for the Madeira and Azores Archipelagos, as well as the extension of the Portuguese Exclusive Economic Zone (EEZ), the production of ENC from those archipelagos was initiated, allowing any ship crossing that waters, navigate along the coast or demand any one of the main harbors to use ENC, contributing to their safety and efficiency.

In accordance with the IHO recommendations, Portugal should produce some International Nautical Paper Charts (INT) from Africa, as well as the equivalent ENC. Realizing that at the moment it is neither possible to conduct hydrographic surveys nor to have access to up-to-date hydrographic data from Angola, Mozambique, Cape Vert and Guinea. But, taking into account the safety of navigation and the lack of ENC coverage in Africa, IHPT decided to start the production of ENC, Usage Band 2 (General), from those countries.

4.2.2 Quality Control / Quality Assurance

The Quality Control / Quality Assurance (QC/QA) of ENC requires not only the verification of the correct graphic representation of all objects, according to the IHO S-57⁽¹⁾ dictionary, but also the integrity of the data in accordance with the IHO S-58⁽²⁾. IHPT has defined that QC/QA of their ENC should be made using the programs included in the tools used for the ENC production, and also with other independent programs. In the final phase of this process the ENC production is externally audited.

¹ IHO Special Publication 57– Transfer Standard for Digital Hydrographic Data .

² Special Publication 58, Edition 2 – recommended ENC Validation Checks.

The first step of the QC/QA process is done using the tools of the production software, CARIS Hydrographic Object Manager (HOM) from USL, and ENCAalyzer from SevenCs.

In the second step its used software independent of the production process, the IHPT choice was dKart Inspector, from HydroService AS.

4.2.3 External Audit

During the QC/QA procedures, a large percentage of errors and warnings are detected and corrected. Then the ENC is verified in the environment where it will be used, the Electronic Chart Display and Information System (ECDIS). An ECDIS is an integrated system of navigation which allows the integration of cartographic information with information from other systems such as positioning systems, showing the real time position over the cartographic information, and also allows a selective choice of the information the user wants to see. The navigation risks can be interpreted automatically through GIS operations such as, the identification of course variations and producing sound alarms whenever appropriate to the situation. For that purpose two software of certified ECDIS systems are used, the Navi Sailor 2400 ECDIS from TRANSAS and the ECPINS from Offshore Systems. The software runs under the S57 file, interprets it and if this file is in agreement with the S57 publication, converts it to a SENC format (System Electronic Navigational Charts). This SENC file represents the database used by ECDIS and is equivalent to the updated paper chart. When visualized in the display, the SENC allows a manual verification of objects and attributes.

4.2.4 Updates

The ENC, as well as the nautical charts, must be kept updated. IHPT also assures the production of the updates to the produced ENC.

4.2.5 ENC Distribution - World-wide Electronic Navigational Chart Database scheme

The first hurdle to the ECDIS acceptance was related with the low quantity of ENC available in number and in coverage. The scheme adopted in 1994 by IHO, had in mind a concept of a world database and makes a perfect distinction between the databases of national data created and updated by each IHO Member State, and the production and diffusion of databases of regional data, under the responsibility of Regional Coordinating Centres (RENC–Regional Electronic Navigational chart coordinating Centres).

Since 2001, the commercialization and distribution of IHPT ENC is carried out through the services of the International Centre for ENC (IC-ENC).

5. PUBLICATIONS

5.1 ENC produced from 2003 to 2006

YEAR	NUMBER	NAME	EDITION
2003	PT548502	Ilha das Flores – Porto de Santa Cruz das Flores	New Chart
	PT548503	Ilha das Flores – Porto das Lages das Flores	New Chart
	PT436402	Arquipélago da Madeira – da Ponta Gorda à Ponta de S. Lourenço	New Edition
	PT538504	Arquipélago da Madeira – Porto do Caniçal	New Chart
2004	PT324201	Vila da Praia de Âncora ao Furadouro	New Edition
	PT324202	Aveiro a Peniche	New Edition

	PT324203	Consolação à Praia das Maças	New Edition
	PT324206	Cabo de São Vicente à Ilha Cristina (Espanha)	New Edition
	PT526306	Porto de Lisboa (de Santa Apolónia a Sacavém)	New Edition
	PT241101	Arquipélago dos Açores	New Chart
	PT343101	Arquipélago dos Açores – Grupo Ocidental	New Chart
	PT343102	Arquipélago dos Açores – Grupo Central	New Chart
	PT343103	Arquipélago dos Açores – Grupo Oriental	New Chart
	PT446405	Ilha Terceira	New Chart
	PT446406	Ilha de S. Miguel	New Chart
	PT233101	Arquipélago da Madeira	New Chart
2005	PT221101	Portugal Continental – Monte de S. Gian a Ayamonte (Espanha)	New Chart
	PT324204	Cabo da Roca à Praia da Lagoa	New Edition
	PT324205	Cabo de Sines à Praia da Arrifana	New Edition
	PT426402	Aproximações a Leixões e Barra do Rio Douro	New Edition
	PT426403	Aproximações a Aveiro	New Chart
	PT426404	Aproximações à Figueira da Foz	New Chart
	PT426407	Cabo Espichel ao Porto de Setúbal	New Edition
	PT426408	Aproximações a Sines	New Edition
	PT526302	Porto da Nazaré	New Chart
	PT528505	Porto de Leixões e Barra do Rio Douro	New Edition
	PT528506	Barra e Porto de Aveiro	New Chart
	PT528507	Barra e Porto da Figueira da Foz	New Chart
	PT528513	Porto de Sesimbra	New Edition
	PT528514	Porto de Sines	New Edition
	PT526308	Barra e Porto de Setúbal	New Edition
	PT526309	Porto de Setúbal (Cais da Socel à Ilha do Cavalo)	New Chart
	PT526310	Barra e Porto de Portimão	New Edition
	PT526311	Barra e Portos de Faro e Olhão	New Chart
PT336201	Arquipélago da Madeira – Ilha da Madeira e Ilhas Desertas	New Edition	
2006	PT426401	Aproximações a Viana do Castelo	New Edition
	PT526303	Baía de Cascais e Barras do Rio Tejo (Porto de Lisboa)	New Edition
	PT526304	Porto de Lisboa (do Rio Jamor ao Terreiro do Trigo)	New Edition

	PT526305	Porto de Lisboa (do Barreiro ao Canal do Montijo)	New Edition
	PT526312	Barra e Portos de Vila R. de S. António e Ayamonte (Espanha)	New Chart
	PT528501	Porto de Viana do Castelo	New Edition
	PT446401	Arquipélago dos Açores – Ilha das Flores e Ilha do Corvo	New Edition
	PT446403	Arquipélago dos Açores – Ilha do Faial e Canal do Faial	New Chart
	PT446407	Arquipélago dos Açores – Ilha de Santa Maria e Ilhéus das Formigas	New Chart
	PT548501	Ilha do Corvo – Porto da Casa	New Edition
	PT548504	Ilha do Faial – Porto da Horta	New Chart
	PT548505	Ilha do Pico – Porto da Madalena	New Chart
	PT548514	Ilha Terceira – Porto de Angra do Heroísmo	New Edition
	PT548519	Ilha de S. Miguel – Porto de Ponta Delgada	New Edition
	PT548522	Ilhéus das Formigas	New Chart
	PT548523	Ilha de Santa Maria – Baía de S. Lourenço	New Chart
	PT548524	Ilha de Santa Maria – Porto de Vila do Porto	New Chart
	PT436401	Ilha de Porto Santo	New Edition
	PT538501	Ilha de Porto Santo – Baía e Porto de Porto Santo	New Edition
	PT200201	Arquipélago de Cabo Verde	New Chart

5.2 Nautical Charts produced from 2003 to 2006

YEAR	NUMBER	NAME	EDITION
2003	36201	Ilha da Madeira	New Chart
	25R11	Ponta de Sagres a Vilamoura	Reprint
	25R12	Vilamoura à Foz do Guadiana	Reprint
	31101	Arquipélago da Madeira	New Chart
	23203	Lisboa ao Cabo de São Vicente	New Edition
	26303	Baía de Cascais e Barras do Rio Tejo	New Edition
	26304	Porto de Lisboa – de Paço de Arcos ao Terreiro do Trigo	New Edition
2004	25R02	Leixões a Aveiro	Reprint
	25R07	Cabo da Roca ao Cabo Espichel	Reprint
	25R01	Caminha a Leça da Palmeira	Reprint
	25R03	Aveiro à Figueira da Foz	Reprint
	25R10	Ponta da Atalaia ao Burgau	Reprint
	26310	Barra e Porto de Portimão	New Edition
	26408	Aproximações a Sines	New Edition

	26311	Barra e Portos de Faro e Olhão	New Edition
	26309	Porto de Setúbal – da Carraca à Ilha do Cavalo	New Edition
	26302	Porto da Nazaré – Plano do Porto da Nazaré	New Chart
	26306	Porto de Lisboa – do Cais do Sodré a Sacavém	Reprint
	25R08	Cabo Espichel à Lagoa de Santo André	Reprint
2005	26403	Aproximações a Aveiro – Barra e Porto de Aveiro	New Chart
	26404	Aproximações à Figueira da Foz – Barra e Porto da Figueira da Foz	New Chart
	25R11	Ponta de Sagres a Vilamoura	New Edition
	24205	Cabo de Sines a Lagos	New Edition
	24204	Cabo da Roca ao Cabo de Sines	New Edition
	24P05	Cabo de Sines a Lagos	New Edition
	24P04	Cabo da Roca ao Cabo de Sines	New Edition
	24206	Cabo de S. Vicente à Foz do Guadiana	Reprint
	157	Selvagem Pequena e Ilhéu de Fora	Reprint
	156	Selvagem Grande	Reprint
	25R09	Lagoa de Santo André ao Cabo Sardão	New Edition
	105	Ilhas Selvagens	Reprint
	26303	Baía de Cascais e Barras do Rio Tejo	New Edition
	26304	Porto de Lisboa – de Paço De Arcos ao Terreiro do Trigo	New Edition
	24101	Cabo da Roca ao Cabo de Sines	New Chart
2006	66301	Porto da Praia – Ilha de Santiago – Cabo Verde	New Chart
	26M01	Baía de Cascais e Barras do Rio Tejo	New Chart
	26312	Barra e Porto de Vila Real de Santo António	New Edition
	26305	Porto de Lisboa - de Alcântara ao Canal do Montijo	New Edition
	25R12	Vilamoura à Foz do Guadiana	New Edition
	25R07	Cabo da Roca ao Cabo Espichel	New Edition
	25R10	Ponta da Atalaia ao Burgau	New Edition
	23203	Cabo Carvoeiro a Vilamoura	New Edition
	24P06	Cabo de São Vicente à Foz do Guadiana	New Edition
	11101	Portugal, Portugal Continental, Arquipélago dos Açores e Arquipélago da Madeira	Reprint
	36402	Câmara de Lobos à Ponta de São Lourenço	New Edition
	26402	Aproximações a Leixões e à Barra do Rio Douro	New Edition

5.3 Hydrographic Charts produced from 2003 to 2006

YEAR	NUMBER	CHART TYPE	NAME	EDITION
2004	SED 5	Sediment	Cabo da Roca ao Cabo de Sines	New Chart
2005	24101	Instruction	Cabo da Roca ao Cabo de Sines	New Edition
2006	1.01	Bathymetric	Atlântico Central e Oriental	New Edition
	1.03	Bathymetric	Atlântico Central e Oriental	New Chart

5.4 Other Nautical publications produced from 2003 to 2006

YEAR	NUMBER	NAME	EDITION
2003	10Z01	Catalogue of Symbols and Abbreviations Used on Portuguese Nautical Charts	New Edition

5.5 Articles, Studies and Oral Communications.

- Guerreiro, R. and P. Sanches, 2007. “A Cartografia Náutica e o WGS84 - A Transição da Carta Náutica para o Sistema WGS84”. Anais do Instituto Hidrográfico, Lisboa;
- Guerreiro, R. and S. Godinho, 2007. “Sobrevalorização da Cartografia Náutica Antiga”. Anais do Instituto Hidrográfico, Lisboa;
- Lourenço, N., F. Artilheiro and A. Campos, 2007. “EM120 Swath Bathymetric Surveys on the Deep West Iberia Margin: Performance and New Geological Insights”. FEMME 2007, Amesterdão;
- Pinheiro, M., H. Julião, A. José, I. Fortes and F. Artilheiro, 2007. “A produção de Cartas Electrónicas de Navegação no IH”. V Conferência Nacional de Cartografia e Geodesia, Laboratório Nacional de Engenharia Civil, Lisboa;
- Pinheiro, M., 2007. “Additional Military Layers: Perspectivas de operacionalidade na Marinha”. Anais do Instituto Hidrográfico, Lisboa;
- Pinheiro, M., 2007. “Produção de Inland ENC na União Europeia”. 5^{as} Jornadas Portuguesas de Engenharia Costeira e Portuária, Laboratório Nacional de Engenharia Civil, Lisboa;
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- Artilheiro, F., F. Pimentel and J. Vicente, 2005. “Estimação dos Erros dos Sondadores Multifeixe”. Anais do Instituto Hidrográfico, Lisboa;
- Campos, A., F. Artilheiro and F. Pimentel, 2005. “Planeamento Assistido Aplicado aos Levantamentos Multifeixe em Águas Profundas”. IV Conferência Nacional de Cartografia e Geodesia, Lisboa;

- Manteigas, P., 2005. “Produção Cartográfica com o CARIS Hydrographic Production Database”. Seminário do Mestrado em Engenharia Geográfica e Geoinformática, Faculdade de Ciências de Lisboa, Lisboa.
- Pinheiro, M., 2005. “The Production of Electronic Charts for Marine Transportation”. XXII International Cartographic Conference, Corunha, Espanha;
- Pinheiro, M., H. Julião, A. José, I. Fortes and I. Silva, 2005. “Produção e Actualização de Cartas Electrónicas de Navegação”. Anais do Instituto Hidrográfico, Lisboa;
- Pinheiro, M., 2005. “Produção e Actualização de Cartas Electrónicas de Navegação”. Centro de Instrução de Tática Naval, Almada;
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INSTITUTO DE INVESTIGAÇÃO CIENTÍFICA TROPICAL (IICT)

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1- INTRODUCTION

The origin of the Portugal's Tropical Research Institute (IICT) dates from 1883, when “Cartography Commission” was created including in its objectives “(...) to make and publish maps and geographic news, representing the results of continuous investigations (...)”. Since then it has passed through several structures and denominations until the present one dating from 1982, maintaining always as one of its objectives to carry on with studies related with cartography and the production of maps of the Portuguese ex-colonies, implementing and promoting the automatic techniques connected with Geomatic Sciences including Remote Sensing, Digital Photogrammetry, Geographic Information Systems (GIS), Image Processing, and Global Positioning System (GPS). Recently reformed, the Geoinformation Sciences are now integrated into the Interdisciplinary Program for Global Development (DES). This program is responsible for an unique heritage concerning the Portuguese Speaking Countries, which includes the geographic information (topographic and thematic maps, geodesic data, aerial photography, soil information, etc).

Nowadays IICT develops and promotes its research activity based on a multidisciplinary approach. IICT objectives are focused on the Community of Portuguese Speaking Countries (CPLP), specifically with the pledge to provide them access to IICT patrimony and collections (Portuguese Initiative assumed by the CPLP Ministries of Science and Technology since 2003) and to monitor the accomplishment of the Millennium Development Goals in CPLP countries (Bissau Summit declaration, July 2006).

The Institute research activities are based on two R&D departments the Department of Natural Sciences (DCN) and Department of Human Sciences (DCH):

- DCN involves research in environment and earth sciences, geographic information (geomatic, land cover change, pyrogeography, physical geography and pedological studies), and applied spatial analysis for environmental management. DCN also develops studies in biodiversity and natural resources, sustainable agriculture and food security, coffee diseases, plant ecophysiology, biochemistry and biotechnology, and livestock health and production.

- DCH is devoted to historical, socio-economic and anthropological research, production of national and sectorial histories and the processes of transformation and social change within tropical societies. The use of common memories of Portugal's colonial past in the construction of identities for the lusophone community, its Diasporas and beyond.

2- RESEARCH AND DEVELOPMENT

The research activity developed by the Geoinformation and Environment research group is related with the implementation of the research projects involving photogrammetric, remote sensing and GIS applications associated with the most recent cartographic methodologies. The following list describes the projects and partnerships presently under research.

- **CVV**- Public Private partnerships for the Development applied to Cape Verde: a tridimensional visualisation system. Coordinator IICT, collaboration with YDREAMS (Portugal) and Direcção Geral de Ordenamento do Território (Cape Verde).
- **RETRO** (FP-V, EVK2-CT2002-00170) Reanalysis of the troposphere chemical composition over the last 40 years. 2003-2005. Coordinator: Max-Planck Institute, Germany. An IGBP/IGAC endorsed project.
- **GLC2000** – Global Land Cover 2000 – Coordinator Joint Research Center, ISPRA, Italy, 2000-2004.
- **GEOLAND** (FP-VI, SIP3-CT2003-502871) - Land cover and Forest change. Coordinator: INFOTERRA, Germany 2004-2007.
- **BRASIL** (POCTI-CTA45126/2002) - Fire in the Brazilian Amazon: multi-year mapping of area burned and estimation of pyrogenic emissions using remotely sensed data. Coordinator – IICT, Start date: Jan 2005 –
- **ANGOLA-COVER** (Funded by participants) - Mapping land cover in Angola 2002/2003 with Landsat, SPOT-VEGETATION and MODIS imagery. Based on a previous collaboration in GLC2000, Institute for the Environment and Sustainability, EC Joint Research Centre/Ispra.
- **CANTANHEZ** (POCTI/BIA-BDE/57965/2004) - Land cover changes and successional pathways in the forests of Cantanhez, Guinea-Bissau. Coordinator – IICT. Collaboration between IICT, IST and Gabinete de Planificação Costeira, (Guinea-Bissau). Start date: Jan 2005. An IGBP/LUCC endorsed project. Coordinator – IICT.
- **FIRELANDSCAPE** (POCTI-AGG-44942/2002) Fire patterns in Portugal (1984-2003). Impacts, risk assessment, and fuel dynamics. An IGBP/LUCC endorsed project. Coordinator – IICT, Start date: March 2004.
- **REEQUIPA** (POCTI/CTA45126/2002) - Remote sensing of land surface biophysical parameters and processes. IICT/ ICAT-Faculdade de Ciências- U. de Lisboa /CBAA- ISA- UTL. Coordinator – IICT, Start date: Jan 2005 -

3- EDUCATION AND TRAINING

The Global Development Program with its Geoinformation unit is responsible for education and training concerning subjects such as cartography, digital photogrammetry, image processing, remote sensing and geographic information systems. Short and long term courses are provided to students and researchers from Portuguese universities and from other countries, namely Portuguese speaking countries in Africa.

4- PRODUCTION

Between 1883 and 1974 the institutions which proceeded IICT were responsible for the production of cartography of the Portuguese speaking countries. Since then IICT has been producing several thematic maps such as the hypsometric and the vegetation maps of Cape Verde and geological maps of Cape Verde, Guiné and Angola. The following list describes some of the work produced by the Institute concerning the geographical maps of the ex-portuguese colonies.

- ANGOLA (1/5 000 000, 1/2 000 000, 1/1 000 000, 1/250 000, 1/100 000).
- CABO VERDE (1/1 000 000, 1/500 000, 1/100 000, 1/75 000, 1/50 000).
- INDIA: GOA, DAMÃO and DIU (1/750 000, 1/300 000, 1/250 000, 1/60 000, 1/50000).
- GUINÉ-BISSAU (1/500 000, 1/50 000).
- MACAU (1/25 000).
- MOÇAMBIQUE (1/2 000 000, 1/500 000, 1/750 000, 1/250 000).
- S. TOMÉ E PRÍNCIPE (1/75 000, 1/50 000, 1/25 000).
- TIMOR (1/500 000, 1/50 000).

Maps produced after 1999:

- Hypsometric map of MAIO island – Cape Verde, 1/50 000
- Hypsometric map of S. VICENTE island – Cape Verde, 1/50 000
- Hypsometric map of BOAVISTA island – Cape Verde, 1/50 000
- Soils map of ANGOLA – District of Bié, 1/750 000
- Carta Agro-ecológica e da Vegetação de S. TOMÉ e PRÍNCIPE, 1/50 000

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1 – INTRODUCTION

The National Statistics Institute of Portugal (INE) is the main entity that in Portugal has the responsibility to assure the production and dissemination of official statistical information, in a frame of independence and permanent attention to the emergency of new information needs, in a Society to which this became an imperative condition for the economic and social development.

The mission of INE is to produce and disseminate quality official statistical information as well as to promote the co-ordination, development and knowledge of national statistical activity.

The main role for the use of cartography within the institute is to support the data collection and the dissemination of statistical information. At present the cartography used by INE consists out of census cartography and supporting geographical reference data.

The population and housing censuses, executed every 10 years are the main force for the development and actualization of cartography within INE. The cartography also has an important role as support for the carrying out of surveys used for the production of official statistical information and is gaining relevance as a support for the fieldwork and sampling designs. For instance, the Portuguese master-sample was selected from the census cartography and, to avoid exhaustion, it is being updated at this moment through fieldwork, mostly prepared in the back-office using several inputs from different sources.

For the purpose of dissemination the cartography is not only used in official publications of statistical information but as well through web mapping applications on internet and intranet. Additionally the geographical reference data and the census cartography is being published as map services, which serve as important databases for some public institutes, like for example the General Directorate of Tax and Customs Information Systems (DGITA), but also by some other institutions.

2 – RESEARCH AND DEVELOPMENT

No major research roles are committed to INE, but the Institute has a central role in the development of the national statistical activity, like mentioned in its mission statement.

INE regularly participates in national and international programmes mainly, in the area of statistics, but also in the area of the production of geographical information.

3 – EDUCATION AND TRAINING

No regular training courses in the field of cartography are offered at INE. But the geoinformation unit of INE is involved in training programmes for Portuguese speaking countries in Africa. Courses have been given in the field of geographical information to statisticians from Cape-Verde, Angola and Mozambique either locally or in house.

Additionally the geoinformation unit received trainees through the special Phare program, from the European Union, for the new member states from countries in Central and Eastern Europe. Occasionally university students are given the opportunity to carry out a work term for the preparation of their final project.

4 – PRODUCTION

From a cartographic point of view INE is responsible for the production of the Geographic Information Referencing Base” (BGRI 2001). The BGRI 2001 is a geographic referencing system based on cartographical or orthophotographical information in digital format. This system makes possible to divide each basic administrative unit, the “Parish”, into smaller statistical areas – statistical sections and subsections –, used as a support for collection and dissemination of statistical information. Another role of INE is the identification of localities, namely the name, delimitation and possible extinction.

5 – PUBLICATIONS

The BGRI is published in digital format with metainformation associated.

Several publications have been presented and produced at conferences and magazines, at national and international level. Most of them are related to statistical subjects, however there are some related to the production of cartography and initiatives in the field of geographical information.

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1 – INTRODUCTION

The decree n.º 13/2003 dated 28 of January, for reasons of functionality and in the scope of the Regional Autonomy, transfers to the RAM the attributions of the IGP in the respective regional scope. The Regional decree n.º11-A/2003/M of 31 of March, creates the Direcção Regional de Geografia e Cadastro (DRGC), being its attributions and abilities transferred in art.º 2.º of decree n.º 13/2003, observing a harmonization between the two decrees.

The abilities that were attributed to DRGC were the following:

- To develop and coordinate the implementation of a Regional Geographic Information System;
- To research and formulate the necessary maintenance proposals to the Regional Geodesic System;
- To promote the Cartographic Production in the region;
- To promote the execution, renovation and conservation of cadastre;
- To elaborate and propose to the approval of the Regional Secretary, legislative measures necessary to market's regulation in areas such as production of geographic, cartographic and cadastral information;
- To collaborate, in the professional action domain, with other institutions or organisms in the implementation of geographic information systems or investigation projects;
- To promote land referencing and identification on cadastre records in RAM;
- To monitor the work, in RAM, of entities licensed from IGP;
- To promote and diffuse the cartographic and cadastral information in RAM;
- To promote, coordinate and make, in RAM, programs and projects under geographic information domains.

2 – RESEARCH AND DEVELOPMENT

2.1 Land information System (Sistema de Informação Predial - SIPNet)

The **Sistema Nacional de Exploração e Gestão de Informação Cadastral (SiNERGIC)** was created through the resolution n.º 45/2006, published the 04 of May. This project, co-ordinate by the IGP, has as main purpose to make possible the existence of land cadastre in Portugal, while exhausting, methodical and up to date data set, to identify the existing properties in national territory, consisting as an indispensable tool to territorial order in fields like politics, environment and economics.

Main Goals:

- To assure properties identification
- To unify existing and produce land contents
- To allow an uniform and informatics management of the land contents
- To guarantee its compatibility with the computing systems used by other entities involved in the project
- To assure that the description of properties is followed by graphical support
- To achieve general use of Public Administration system
- To assure the access to the information by the citizens and companies.

DRGC in contribution with IGP, promoted the development, in RAM, of the Land Information System (SIPnet) that is an application available in internet and intranet for consultation and conservation of Cadastre

The systems implementation is foreseen for September 2007 and will involve some institutions and services, such as:

- Direcção Regional de Geografia e Cadastro;
- Direcção Regional dos Assuntos Fiscais;
- Direcção Regional da Administração e Justiça;
- Direcção Regional de Agricultura e Desenvolvimento Rural;
- Direcção Regional do Património;
- Direcção Regional de Estatística;
- Municípios;
- Peritos Cadastrais;
- Titulares Cadastrais.

SIPnet is a Key Point for the administrative modernization of processes and procedures, in virtue of being a system used for the Public Administration and Civil Society for the most diverse ends.

2.2 Regional Infrastructure of Geographic Information (IRIG)

The DRGC, in the scope of its attributions, is implementing the projects RREG (Regional Network of Geographic Information) and PROSIG (Project of Geographic Information System) that has as main goal the implementation of Regional Geographic information Infrastructure (IRIG) of the Autonomous Region of the Madeira (RAM).

The Regional Network of Geographic Information has as goal the creation of an infrastructure to support global and sub-project that composes the IRIG. Its components will be the central nucleus (DRGC), local nucleus (City councils) and other partners that produce and use the geographic information.

The principal aim of PROSIG is to endow the City councils with a solution that optimize and harnesses the use of Geographic Information produced by the DRGC and the City councils, making it available in the internal net (Intranet) of each City councils.

2.3 – GEOCID

The GEOCID will be the visible part for general public of IRIG, having consisted as a platform, especially developed for the citizens, of access, searches, visualization and exploration of information. Through this system a vast set of geographic information will be available to support the exercise of the citizenship.

The GEOCID will be visible under the form of a portal in Internet, integrating geographic information in digital format, produced by DRGC, and IRIG associates themselves, some of the main abilities of this Regional Institute:

- To promote the spreading and the generalized access to geographic information;
- To guarantee the free access to citizenship ruling information;
- To promote projects of technological innovation intended to improve the access to information.

The informative structure of this will be:

- Institutional Information;
- Cities detailed Information;
- Statistical Information;
- RAM's Digital Atlases;
- Cadastre;
- Guide of Madeira: applications for exploration of geographic information;
- Image Data Base;
- Discussion group;
- Historic Geographic Information.

3 – EDUCATION AND TRAINING

During period 2003-2007, the DRGC carried through formation in some fields. In the project IRIG, DRGC has lecture formations to some institutions and adherent regional services, in following softwares:

MicroStation V8;
NGXis V8;
Geomedia Pro 6.0
Geomedia Terrain
Geomedia Grid
ImageStation Stereo Display
ImageStation Manager
ImageStation Feature Collection

We still carry through, in region schools, formation in the area of Geographic Information Systems destined to Geography and Biology professors. Furthermore we participate in the organization of Geography expositions, supplying educational material and technical equipment, in order to get self-motivated exhibits and to present the new trends and tools in Geographic Information.

4 – PRODUCTION

4.1 GPS Regional Network of Permanent Station

The DRGC promoted the creation of the GPS Regional Network of Permanent Stations consisting by 3 stations: Funchal, Ribeira da Janela and Porto Santo, having each one of them the following products:

- RTK by GSM;
- RTK by Internet;
- RTK by Radio;
- Pos-Processing data.

All these products can be acceded from the portal of GEOCID, free of charge.

4.2 Geodesic Regional Network

The DRGC is responsible for the maintenance of the geodesic network of the RAM. In the total, the RAM makes use of 120 Geodesic Vertices and 278 Marks in UTM - 28N and WGS84.

In these last four years, the works of consolidation of the geodesic network executed in RAM had been:

- Construction and survey of 190 marks;
- Construction and survey of 46 TCs;
- Construction and survey of 26 geodesic landmarks.

4.3 Official Administrative Map of RAM

In contribution with IGP, DRGC elaborated the Official Administrative Map of the RAM (CAORAM). In April of 2006 version 5 was finished, gotten through existing information in the maps of cadastre, field work and contribution from some City Councils.

4.4 Roads Map 1:50000

The DRGC elaborated the RAM's maps of roads, having been published first version in December of 2006, with an update semester. Beyond the regional roads (fast ways, express ways and old regional roads) and for the city roads, the map has the localization of viewpoint, as well as the name of places.

4.5 Aerial Photographic

In March of 2004, was executed the first Aerial Photographic project of Madeira Island and Porto Santo promoted by DRGC, having as main goal the execution of Orthophotomaps, Regional Topographic Map and to provide the RAM with air photographs for official planning and management. The characteristics of this project are 1:8000 scale below of the 600 meters and 1:18000 above of 600 meters having a longitudinal overlapping of 82% and lateral of 40%.

Presently, DRGC is proceeding with the execution of a new project that has the intention of cover the totality of the Archipelago of Madeira, 1:18000 of Madeira and Porto Santo Islands and 1:8000 in the Desertas and Selvagens Islands. In this project, the longitudinal overlapping will be of 85% and 40% in lateral overlapping.

4.6 Orthophotomaps e Altimetry Numerical Model

In 2006, the project of Ortofotomapas and altimetry information (GRID, TIN, and Altimetry Numerical Model) of RAM was finished, executed from Aerial Photographic of 2004. Orthophotomaps were produced by 1:2000 scale below the 600 meters and 1:5000 above 600 meters.

4.7 Madeira Atlases

The RAM's Photographic Atlases will provide a picture of this region seen from air, supplied from an integral coverage of Orthophotomaps with different scales: 1:16000, 1:8000, 1:4000 and 1:2000. This publication will be not only targeted for professionals but also for citizens since it is a project with great interest and utility, produced by DRGC in the context of its organic abilities, nominated to the level of the sectors of the public works, roads, urbanism, order of the territory and geographic and cadastral information.

The goal is to edit a reference workmanship that characterizes the RAM in its aspects from landscape point of view.

4.8 Satellite Image SPOT5

Images of Satellite SPOT5 of Madeira Island had been captured - Panchromatic and Multi-spectral, with posterior orthorectification, endowing the region with multi-spectral radiometric geographic information.

4.9 Digital conversion of Geometrical Cadastre

At this moment, the DRGC is finishing the process of digitalization into vector the totality of the Geometric Cadastre existing in RAM. This will allow supplying digital background for an informatics system of Cadastre called SIPNet, which will permit citizens access through the web.

4.10 Up Load Of Cadastre Data Base

In this project, was Up Load in a database the totality of the alphanumeric properties of existing Cadastre in RAM. In this way, we have got a property-owner database and the respective properties, allowing an easy, fast and coherent update of the properties. The project was finished in September of 2005

4.11 Metadados

In partnership with the Universidad of Zaragoza, was created a multilingual application in open source - CatMDEdit - with intention to create a Database of Metadados of all the geographic information produced and existing in the RAM. Inserted in project IRIG, the services who managed and produced geographic information, had created proper metadados of the existing information. The DRGC is responsible for the technical fulfilling, accompaniment, management and update of the metadados register.

4.12 Planning Tools System

The goal is to make available data in the territory range in order to manage essential instruments for taking decisions in RAM. Thus, with this project, we obtain a harmonization of some existing instruments of planning in the region: PDM, POOC, POTRAM, POT.

4.13 Digital Regional Topographic Map

This map is under construction, and it will be based on a comprehensive object catalogue and multi-cod system. By the end of year, RAM will have a Digital Topographic Map at 1:5000 scale.

5 – PUBLICATIONS

5.1 Roads Map 1:50000

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1 – INTRODUCTION

INIAP - National Institute for Agricultural and Fisheries Research as become, since November 2002 until Apr 2007, the R&D major institution of the Ministry for Agriculture, Rural Development and Fisheries – MADRP, as a result of merging former INIA - National Institute for Agricultural Research, created in 1975 and IPIMAR - National Institute for Sea and Fisheries Research, created 1978. Since May 2007, and as a result of new merges between INIAP and other MADRP research institutions, within the framework of Portuguese public administration reform, its place has been taken by INRB – Instituto Nacional de Recursos Biológicos, IP, whose aims and structure are yet to be defined. Therefore all the work listed below has been achieved during the period of INIAP existence, corresponding to the ICA report reference period (2003-2007).

Aims of former INIAP:

- To conduct R&D, as well as all scientific and technical activities necessary to the increase of competitiveness of agriculture, livestock, forestry and fisheries;
- To develop scientific and technological bases supporting the fisheries policies, including resource management, aquaculture, the marine environment and the manufacturing industry,
- To undertake all necessary actions oriented to improve production standards, simultaneously ensuring the preservation of genetic resources and biodiversity in agriculture, livestock, forestry
- To provide scientific and technical support to the agriculture, livestock, forestry, fisheries and all related activities.

Main research areas:

- Natural Resources and Environment;
- Plant Protection;
- Olive Growing, Olives and Olive Oil;
- Grape growing and Oenology;
- Ecophysiology, Genetic Resources and Plant Breeding;
- Production Technologies for Vegetables, Fruits and other Crops;
- Silviculture, Management and Forest Products;
- Animal Nutrition;
- Reproduction, Genetics and Animal Improvement;
- Systems and Techniques for Animal Production;
- Conservation and Transformation Technologies of Agrarian Products;
- Agrarian Economy and Sociology – Development;
- Aquatic Environment;
- Fishing Technology and Exploration;
- Marine Resources;
- Fisheries Socio-economics;
- Aquaculture;
- Fish Product Innovation and Development

2 – RESEARCH AND DEVELOPMENT

One of former INIAP research units is EFN (Estação Florestal Nacional – *National Forest Research Station*) responsible for conducting forest and environmental research.

Some of EFN research projects have cartographic output, or are dealing with remote sensing methodologies for automatic cartographic purposes. Some of the most relevant and recent projects with this goal are briefly presented below:

2.1 - **Project Title: Tipificação dos montados de sobro e azinho dos concelhos de Mora, Aviz e Arraiolos e dos sistemas de exploração associados. Identificação dos principais problemas e medidas para a sua gestão integrada e conservação.**

Other portuguese Institutions involved:

E.A.N. - Estação Agronómica Nacional

U.E. - Universidade de Évora

D.G.F - Direcção Geral das Florestas (actually DGRF)

This project was concerned with the montados (cork and holm oaks agroforestry system) of an area of 50 000 ha in Alentejo. One of the many goals of the project was to elaborate a geographical database and cartography for the region. This project produced two new maps for the region at the scale of 1:25.000: A Forest Cover Map and a Vegetation Series Map.

2.2 – **Project Title: Modelação de indicadores de biodiversidade para a selecção e gestão de áreas de protecção de espécies de árvores florestais em Portugal Continental.**

Other portuguese Institutions involved:

D.G.F.- Direcção-Geral das Florestas and

I.C.N. - Instituto da Conservação da Natureza

This project produced as an output the *Map of Forest Types of the Portuguese Mainland* at the scale of 1:1.500.00.

In the last revision of the National Forest Inventory (DGF, 2001) variables were included describing the vertical structure and composition of forests on the Portuguese mainland, in order to characterize their biodiversity. The forest vertical structure was assessed by the cover percentage of seven height classes and the composition of the different layers described using plant species, or groups of plant species, easily identifiable on the field.

2.3 – **Project Title: Nova Carta Ecológica Florestal de Portugal (1:500 000). Modelação bioclimática e da vegetação natural potencial como instrumento para a planificação e gestão sustentada do espaço florestal em Portugal.**

Other Institutions involved:

D.G.F. - Direcção-Geral das Florestas (actually DGRF) and

I.S.A. - Instituto Superior de Agronomia

The goal of this project is to contribute to the evaluation of the productive potential and the conservation value of existing forest areas and therefore to the choice of the species for new plantations, by establishing in an interactive G.I.S., an actualized bioclimatic model and a natural potential vegetation model.

2.4 – **Project Title: Desenvolvimento de metodologias para a cartografia de inventário florestal dos montados a partir de informação proveniente de imagens de satélite e de SIG.**

Collaboration of other Institutions:

I.G.P. – Instituto Geográfico Português and

E.N.G.R.E.F. (École Nationale du Génie Rural des Eaux et des Forêts) – Montpellier (France).

The goal of this project is to develop a methodology for the automatic cartography of the Portuguese “montados” (cork and holm oak agroforestry systems) at the scale of 1: 50.000, by the classification of satellite images and ancillary data.

3 – EDUCATION AND TRAINING

Researchers and technicians involved in mapping activities attended specialized training courses in international research laboratories and national courses in G.I.S. and remote sensing. E.F.N. also promotes and gives assistance to master’s and PhD scientists in several research areas.

4 – PRODUCTION

It is not a aim of INRB nor EFN to *produce* cartography, nevertheless and in the context of several research projects, the Department of Ecology, Natural Resources and Environment (D.E.R.N.A.) of EFN has been involved in the conception and production of several thematic maps of local or national areas at different scales, such as: Vegetation Series Maps (which express all the vegetation communities that can occur in a site throughout time and depending on anthropogenic activities and have high value for land-use planning purposes); a Biogeographical Map of Portugal (a system of natural uniform eco-regions expressed as a hierarchy within a world-wide accepted system of biogeographical classification. Used to express ecological context of several biological or ecological entities. Also of great value for land-use planning); Bioclimatic Maps (Thermotypes and Ombrotypes: expressing complex rain and temperature regimes that have high correlation (and hence predictive power) with vegetation types. Used to vegetation spatial modelling); but also a Forest Types Map and a Forest Cover Map. The list below describes the maps produced:

- Carta de Séries de Vegetação e de Biótopos da Serra da Arrábida (Scale 1:25.000).
(*Vegetation Series Map and of Biotopes of Serra da Arrábida*)
- Carta Biogeográfica de Portugal Continental (Scale: 1:000.000)
(*Biogeographical Map of the Portuguese Mainland*)
- Carta de Séries de Vegetação da Ilha da Madeira (Scale: 1:200.000)
(*Vegetation Series Map of Madeira Island*)
- Carta de Termotipos da Ilha da Madeira (Scale: 1:200.000)
(*Thermotypes Map of Madeira Island*)
- Carta de Ombrotipos da Ilha da Madeira (Scale: 1:200.000)
(*Ombrotypes Map of Madeira Island*)
- Carta da Tipologia Florestal de Portugal Continental (Scale 1:1.500.000)
(*Map of Forest Types of the Portuguese Mainland*)
- Carta do Coberto Florestal de 1995 (50 000 ha nos Concelhos de Mora, Aviz e Arraiolos)
(*A Forest Cover Map of 50 000 ha in Alentejo region*) (Scale 1:25.000)
- Carta de Séries de Vegetação (50 000 ha nos Concelhos de Mora, Aviz e Arraiolos) (*A vegetation series map of 50 000 ha in Alentejo region*) (Scale 1:25.000)

5 – PUBLICATIONS

The most important publications with cartographic output in which the institution was involved are:

ALMEIDA, A. F. and J. H. CAPELO (1996) - Carta de Séries de Vegetação e de Biótopos da Serra da Arrábida. *Silva Lusitana* 4(2): 259-264. E.F.N.. Lisboa, Portugal.

CADIMA I., MESQUITA, S. and CAPELO, J. (2001) - Evolução de uma paisagem florestal no Alto Alentejo – Poster presented at the “*I Jornadas Ibéricas de Ecologia da Paisagem*”. 17 a 21 de Abril de 2001. E.S.A.B.. Bragança.

CAPELO, J., M. SEQUEIRA, R. JARDIM, J. C. COSTA and S. MESQUITA in CAPELO, J. (ed.) (2004) -

Guia da excursão geobotânica dos V Encontros ALFA 2004 à Ilha da Madeira. *Quercetea* 6: 5-45. ALFA/INAG.

COSTA, J. C , C. AGUIAR, J. H. CAPELO, M. LOUSÃ and C. NETO (1998) - Biogeografia de Portugal Continental. *Quercetea* 0: 5-56. ALFA/INAG.

GODINHO-FERREIRA, P.; AZEVEDO, A. and REGO, F. (2005) – Carta da Tipologia Florestal de Portugal Continental. *Silva Lusitana* 13(1): 1-34. E.F.N..Lisboa. Portugal.

MESQUITA, S., J. CAPELO and J. SOUSA in CAPELO, J. (ed.) (2004) - Bioclimatologia da Ilha da Madeira: abordagem numérica. *Quercetea* 6:47-60. ALFA/INAG.