HIGH LEVEL FORUM ON GLOBAL
GEOSPATIAL MANAGEMENT INFORMATION

Second Forum
Doha, Qatar

Country of Algeria

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I Introduction

Spatial or geographic information is considered nowadays as a basic component for national development at all levels of decision making. This importance results from the universality of applications allowed using geographical information and the cost of acquiring and maintaining it. The national tendency is under discussion aiming to the establishment of a national infrastructure for geographic information.

Acting as the main authority for national mapping and geographical information production, Algeria submit via the National Institute of Cartography and Remote Sensing (INCT) to the second forum of GGIM initiative, the present report as the National Report describing in general the activities undertaken and progress of the country in mapping and space related activities.

A reflexion at national level is ongoing between actors concerned by the production and the use of geospatial information, mainly the Algerian Space Agency, INCT, National Agency of Cadastre, Geological Services, Maritime services and all others users, on the project of putting a National Geospatial Information Infrastructure.

At this moment, this report is therefore dedicated to the presentation of main activities in mapping area, cadastre products and space based activities.

For the mapping domain, this includes activities in the following fields:

- Geodetic, gravimetric and levelling networks;
- Geographic databases and GIS development;
- Mapping production;
- Thematic mapping;
- R&D activities;

CARTOGRAPHY

II Presentation of INCT

The National Institute of Cartography and Remote Sensing (INCT) created in 1967, is from 2009 an Industrial and Economic Public Enterprise under the MoD supervision. Its main missions concern the production, collect, R&D, conservation and dissemination of geographic information over the national territory.

Its main missions can be presented as follow:

- Realize and maintain over the national territory of a geodetic, gravimetric and leveling networks;
- Cover the territory with aerial photography;
- Establish and update topographic maps at 1/50 000 and 1/200 000 scale and their derivatives;
- Acquire and conserve satellite imagery;
- Realize geographical databases;
- Undertake R&D works in geographical sciences area;
- Maintain the national archive of geographical information ;
- Etc.

The main activities in R&D domain are undertaken in the objective of satisfying the requirements and needs of the production departments of the institute. From 1967, INCT was dedicated to accomplish its missions in terms of national mapping and establishing the base networks of a territory of 2,38 millions km² representing the national territory. The progressive automation of its production structures has enabled new perspectives from data acquisition to processing and the presentation of its products. This approach, enabled to the institute to enhance its efficiency, grow its production and finally organize and structure its production for an efficient exploitation by its customers.

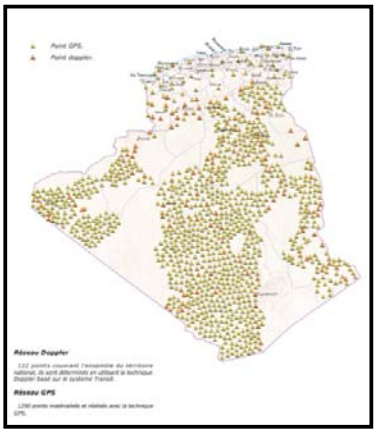
INCT has nowadays many customers representing various sectors like the Defence, Agriculture, Territory managers, Telecommunications, Energy, Cadastre and all the organisms with a territorial vocation concerned by the use of geographic information.

III Base equipment

III.1 GPS Network

In the framework of the Tyrenean Geodetic NETwork project, INCT has observed in 1998 its zero order GPS network simultaneously with the observation TyrGeoNet campaign. Twelve (12) points have been observed during 72 hours and processed using Bernese software. The accuracy resulted is centimetre level.
Another eight (08) points have been also observed in June 2000 during one week and processed using WinPrism software using operational ephemerid. The accuracy of these points is decimetre level.

During June 2005, 15 points from the zero order GPS network have been observed during one week and processed with precise IGS products using the Bernese 5.0 software.



Doppler and GPS netwok over Algeria

The first order GPS network complements the North classical geodetic network and enabled the equipment of the national territory. The 1st order GPS network is composed of 1180 points distant from 25 to 50 km. The observations are done using dual-frequency receivers during two hours. The relative accuracy of this network is about 3 cm. In the other hand; INCT is undertaking great effort to deploy the Algerian GNSS network through the whole country. Nowadays, 06 permanent GNSS stations are already installed and operational. During the coming years, others stations will be installed to cover the country.

III.2 Gravimetry network

The national gravimetric network is composed of two sub-networks, namely:

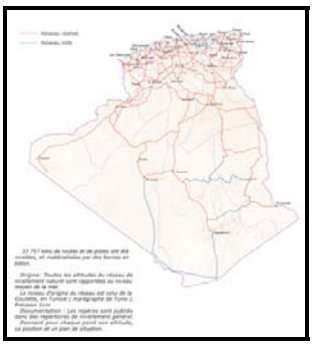
- The fundamental network composed of 12 absolute points observed in 2011 using GF5-111 gravimeter of the National Science Foundation of the United States of America. The observations have been processed using software provided by Micro-g solution Inc, following exactly the international conventions in use in this domain. The mean accuracy of this network is about 1.5 µgal.

- The secondary network composed of 1985 points obtained by relative gravity measures using Lacoste&Romberg gravimeter, distant from each other of about 30 Kilometers, and connected to the precise levelling network. The accuracy of this network is about 0.02 mGal.

The maintenance and densification works are undertaken particularly along the roads during regular periods.

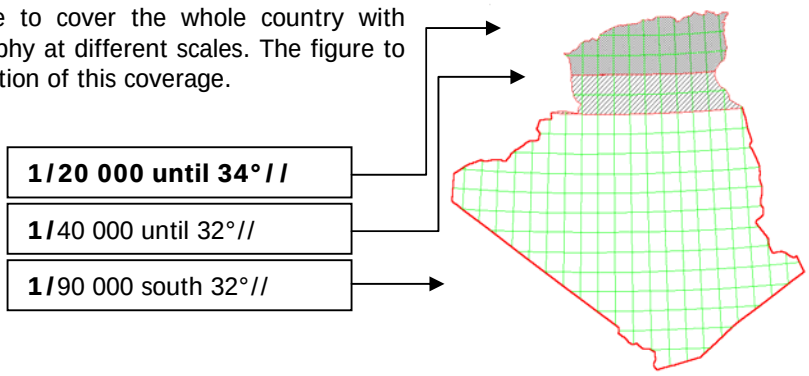
III.3 Leveling network

The Algerian General Leveling network (N.G.A), composed of two sub-networks, contain presently 40255 Kilometers, covering the whole national territory. The mean relative accuracy is at centimeter order. The actual works concern the maintenance and the densification of this network.



III.4 Aerial photography activities

The INCT has the charge to cover the whole country with systematic aerial photography at different scales. The figure to the right shows the disposition of this coverage.



In order to accomplish this mission, INCT dispose of its own capacities for aerial missions execution: Beechcraft KING AIR B200 airplane acquired on 1996, equipped with 02 analogical cameras RMK TOP 15 (or middle altitudes), 02 analogical cameras RMK TOP 30 (for low altitudes), 02 analogical cameras RMK–A (for high altitudes), GPS stations, and a Beechcraft KING AIR 350ER acquired in 2011 equipped with a digital DMC-I camera.

In addition to that, the following missions are executed depending on the purpose of the activity:

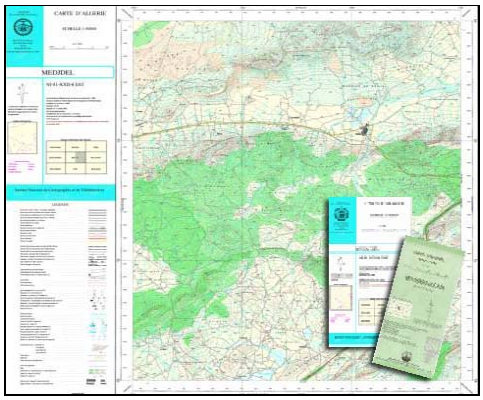
- Aerial photography at 1/75 000 pour base map 1/50 000 production,
- Aerial photography at 1/60 000 for base map updating,
- Aerial photography with trajectography for large scale production and specific projects.

III.5 Photogrammetric activity

The photogrammetric activities are undertaken at INCT facilities for mapping and others specific needs. The replacement of old analytic equipment by numerical machines is an ongoing process. The actual infrastructure contains 08 analytical stations, more than 35 digital workstations Z/I, SummitEvolution DAT/EM and SocetSet/BAE systems, MATCH-AT/Inpho and ISAT/ZI for aerotriangulation. A great effort is undertaken by INCT to enforce the photogrammetric production equipments.

IV Base map activities

IV.1 Base map 1/50 000 – New edition



During last decades, the important technological evolution in geographic information managing and process, has involved huge changes on the techniques of mapping production.

Being aware of this technological change and in order to improve the map production process, the National Institute of Cartography and Remote Sensing has adopted an operational approach to include these new techniques in new maps production and updating old ones.

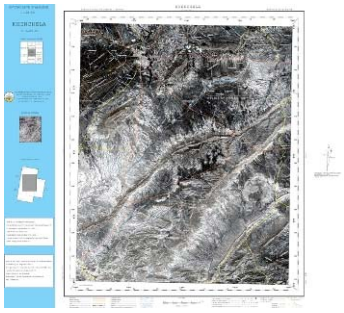
Hence, the map production at the institute is nowadays automated from the acquisition of the data until the graphic representation.

INCT has launched beginning 1980 a new programme for a regular topographic cartography at scale 1/50 000 replacing the old cartography, which was considered obsolete, as well for the 1/200 000 scale cartography.

The Lambert conic projection system has been abounded for the UTM system and new tiling map has been adopted.

From 2007, the institute has started a new process to update base maps at 1/50 000 scale from the topographic database using new aerial photography coverage. The process is on continuous improvement using new techniques and tools (StereoAnalyst, etc). The use of generalization techniques is also being studied, this has resulted on developing new tools to derive 1/200 000 scale maps from 1/50 000 data.

IV.2 Cartography using satellite imagery



The National Institute of Cartography and Remote Sensing through its Remote Sensing Centre, is also active in the domain of spatial cartography, and has introduced the use of satellite images at different resolutions (ALSAT2, SPOT, LANDSAT, QuickBird, WorldView, etc) in its production structures. In this context, the national territory has been covered with spacemaps at scale 1/200 000 enabling at the same time the updating of the old data. The generalization of this technique for 1/50 000 mapping is also considered. The use of satellite imagery for cartographic production is also considered as well as developing thematic mapping products.

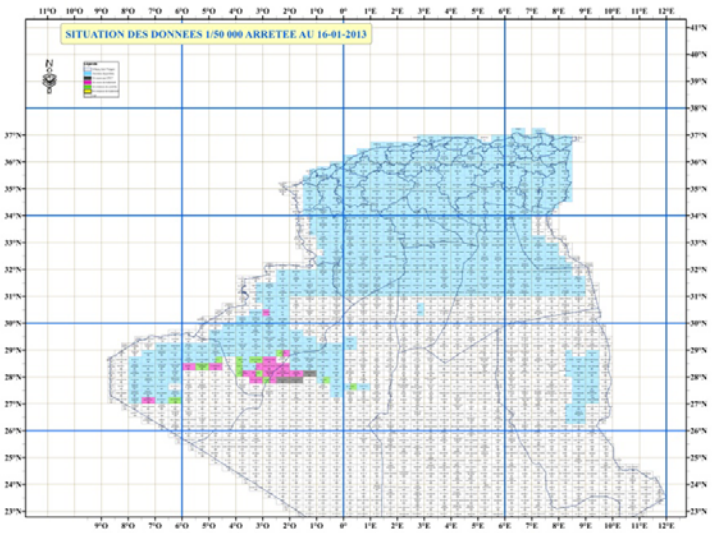
IV.3 Databases

Considered as an important component for geographical information systems, the institute has been engaged from 1990 to put on appropriate procedures and mechanisms for data acquisition, process and data update, in the objective to handle customer's needs in terms of quality, coherence and exhaustively of the products proposed.

INCT proposes to its customers nowadays many products organized as geographical date bases, like geodetic database, names database, topographic database at 1/50 000, Raster databases at different scales. Other databases are actually under development and concern cartographic database at 1/200 000, Roads database, altimetry database and the image database (satellite images, orthophotography, etc).

A new process for map updating is also under of finalization based on both aerial and satellite images. The main objectives expected from the 1/50 000 scale database are:

- Offer structured data for GIS applications,
- Enabling general consultation of cartographic information,
- Sharing the use of databases between different customers (mapping activities, Research, specific works, etc),
- Generate derived products (DTM, GIS applications, etc)
- Etc.



Numerical data 1/50 000 DB integration

V Thematic mapping

Many institutions are dealing with thematic cartography: geology, hydrology, urban applications. The institute offers also a large variety of products in this area like; education maps, 3D maps, Atlases, etc.

Thematic maps produced by INCT facilitate interrelated different disciplines. They present derived information from different sources, and combine different topics with spatial reference in an understandable manner for users. INCT has undertaken this task to satisfy the growing needs in this area by proposing:

- City maps,
- General maps at different scales,
- Road maps,
- Geological maps,
- Touristic maps,
- Atlases,
- Etc.

VI Research & Development

VI.1 Global Spatial Data Infrastructure

INCT has participated to the Global Spatial Data Infrastructure initiative launched by ESRI, by updating cartographic information at 1/1000 000 structured using the International Steering Committee for Global Mapping specifications. This information can be downloaded from

the website: *http://www.iscgm.org/temp/GM_algeria.zip*.
INCT continue effectively participation to the initiatives launched by ISCGM.

VI.2 Topographic geodatabase update

In order to optimize the cartographic update process, INCT has introduced in the production process the GPS/GIS solution, using GPS receivers and complete tools for data collection (PDA, Numerical tablet). The data processing is handled in real time using EGNOS corrections (for the North part of the country), or in post-processing (for the South part). This technique is being generalized in the field works.

All the map updating process at 1/50 000 scale is under refection by introducing the field information and the numerical photography identification. The use of satellite imagery is also considered as well as the generalization techniques where it is intended to use 1/50 000 data to update the 1/200 000 cartography. The use of other sources like LiDAR, is also under investigation.

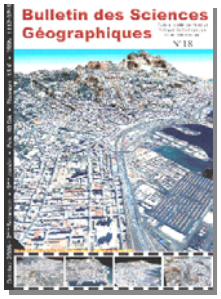
VI.3 Geodetic infrastructure valorization

Geodetic works are the base for all mapping activities. A great effort is needed to cover the whole country with precise networks. Many projects are conducted both with the National Centre of Spatial Techniques (CTS) on the following topics:

- Determination of a precise national gravimetric geoid,
- Determination of a new national altimetry reference,
- Definition of a new tridimensional geodetic system based on GNSS techniques,
- Refection of the national geodetic system (Nord Sahara) and his link to international spatial systems.

VI.4 Geographical Sciences Bulletin

INCT publish regularly from 1998 a semestriel scientific letter « Bulletin des Sciences Géographiques » - ISSN 1112-3745.



This scientific publication is an area of reflexion, information exchange and discussions for the scientific community acting in geographical sciences. Many contributions are received from local and international experts dealing with all the new techniques in this domain.

Also, during 2012, INCT has organized the first conference on the National Infrastructure of Geographic Information (INDG), where more than 200 participants from public and private actors, have taken part. Other the recommendation to prepare the environment to develop the INDG, INCT has been chosen the focal national point to develop this project.

SPACE TECHNOLOGY RELATED ACTIVITES

The creation of the Algerian Space Agency (**ASAL**) by presidential decree N° 02-48 of January 16th 2002, translate the decision of high authorities to master spatial technologies and their applications as a strategic objective to serve the economic, social and cultural development.

Considered as the instrument of the Government concerning conception and implementation of the national policies of promotion and development of the spatial activity, ASAL has established a national spatial program - horizon 2020 (PSN), elaborated in narrow collaboration with the different concerned national sectors and adopted by the Government in November 2006.

This program leans on five axes:

- The realization of projects of spatial systems for Earth observation and telecommunications and the involvement in international satellites projects;
- Setting up of associated infrastructures to ensure the base of the national spatial activity;
- Setting up of a human, material and infrastructural potential able to contain the national spatial activity and its insertion in a society of information which is necessary to contribute to the development;
- The implementation of the international cooperation;
- Master the applications and services issued from the spatial systems for the socio-economic development.

In its applicative part, the national spatial program - horizon 2020 contains about 86 operational projects covering the needs of socio-economic development of the country. These projects are implemented for the ministerial departments and institutions concerned by the use of the satellite imagery, the Geographical Information Systems and positioning, thus, they constitute a barometer measuring the impact of the spatial techniques on the national socio-economic development.

The actions undertaken by the ASAL in the setting of the realization of the national projects integrate in a coherent form, with the attention to answer the demand of the national economic sector, to encourage it also to take the necessary arrangements to ensure by themselves the follow-up of their projects. Many domains of activities are concerned by the actions of the PSN, particularly:

- The prevention and the management of the natural hazards;
- The assessment of the natural resources;
- The development of the basis infrastructures.

Below, a non exhaustive list of the recent applicative projects led by the ASAL within its national partners:

1 - Contribution of the spatial tool to the prevention and the management of the natural hazards

2 - Contribution of the spatial technologies to master urban development

3 - Contribution of the spatial technologies to the assessment of the natural resources

4 - Contribution of the spatial technologies to development of the base infrastructures

Six (06) other projects regarding the definition of a new National geodetic reference frame (Planimetry and Altimetry) were registered to answer to the preoccupations expressed by the National Spatial Program.

The Atlas Project of the Algerian Solar Stratum by the use of satellite imagery has been initiated also by ASAL. This project aims to put in synergy institutions composed of research centers and laboratories leading to the realization of a solar information system allowing access to dynamic values of the different components of solar radiance (global direct and diffuse) to the hourly, daily scale.

Furthermore, in the framework of the execution of the National Space Program, a Reception and Exploitation of Satellite Imagery Centre (**CREIS**) was created. This centre is composed of:

- An acquisition, control and command station based in Ouargla (South-Est of Algeria) for Alsat2, IRS-P6, Cartosat-2, missions acquisition and processing. This segment disposes also of command and control capabilities for ALSAT2 satellites.
- Production facilities based at the same facilities of INCT.

CADASTRE ACTIVITIES

The activities of national cadastre are handled by the National Agency of Cadastre (**ANC**) under the Ministry of Finance authority. In terms of achievements we can note the following national progress:

- For the Saharian zones:
  - Total number of communes: 332
  - Total number of depository communes: 314
  - Total area depository: 208 970 314 Ha
  - Number of cadastre plans produced: 1123
  - Coverage: 82%

- For Urban zones:
  - Total number of agglomerations: 1669
  - Number of cadastred agglomeration: 350
  - Total area: 156 421 Ha

- For rural zones:
  - Cartographic plan produced: 20 507 863 Ha
  - Total of depository communes: 688
  - Total area: 9 728 147 Ha

(2012 statistics)