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Country Reports

National Report - Iran [*]

[*] **Prepared by National Cartographic Center of Iran (NCC)**

National Report
National Cartographic Center of Iran (NCC)

Iran is a country with an area of more than 1600000 km2 that contains a great topographic diversity and 2500 km coastal borders. National Cartographic Center of Iran (NCC) is the main authority for production of maps and spatial information under the I.R. President's Deputy for Planning and Strategic Supervision. It has more than half a century of experience in this respect.

NCC has 800 well experienced personnel utilising the latest technologies in map and spatial information. Based on the ISO 9001-2000 Quality Management system, NCC undertakes supervision and technical control of mapping and spatial information projects. These projects are carried out by NCC itself, other governmental organizations and private mapping companies. Production of base map of the country of Iran at 1:25000 scale, marine charts at 1:25000 and 1:100000 scales, design and establishment of National Geodetic Control as well as Geodynamical networks, establishment of national, regional, and urban spatial topographic databases, production of small scale base maps at 1:50000, 1:100000, and 1:250000 scales and national atlases are examples of what have been accomplished by NCC.

The development of Geomatics during the last half century in the world has faced considerable challenges in different aspects in Iran. This was not possible without great efforts of spatial data producers and users as well as people in research and education. Issues such as growing demand for cartographic products, great interest in Geomatics education, revolutionary movement towards digital technology, standardization efforts in this field and popularity of GIS and remote sensing applications has led to development of the country in the field of Geomatics.

Several national organizations, ministerial and municipal offices as well as many private companies are active in the field of mapping and spatial information production in Iran. Their activities and products are needed by decision makers and general users. The national organizations concentrate their efforts on small-scale base mapping. Other governmental surveying offices and private companies are mostly involved in high resolution spatial information production needed for national and provincial projects.

Also majority the research in the fields of photogrammetry, remote sensing, GIS and digital mapping are carried out by national organizations, institutions and universities. However, a few private companies are also making remarkable progress in research for commercial products and services.

According to the abovementioned, NCC declares its readiness to conduct and supervise all kinds of mapping and spatial information projects at the national and international levels.

Following is a list of activities that are being carried out in NCC.

Geodesy and Geodynamics

The following activities are done in this section:

- **Establishment of Iranian Permanent GPS Network**

National Cartographic Center of Iran (NCC) is completing the Iranian Permanent GPS Network for Geodynamics (IPGN). This network facilitates better understanding of tectonic deformation which

allows estimating of future hazards and promoting scientific knowledge. The network consists of two parts: a) base network that covers the entire country of Iran, consisting of 41 GPS stations and b) three local networks in the most populated and active zones. The base network, has been established in areas of main tectonic activities such as Zagros and Alborz Mountains. Raw GPS data are collected, stored, and sent to Tehran processing centre on a daily basis for final processing. The local networks are established in Tehran, Azerbaijan, and Khorasan with critical tectonic activities. The capital Tehran, with population of about 12 millions, is located in the foothills of Central Alborz where a highly active zone is. To study of tectonic deformations, 31 permanent GPS stations, some of which are belonged to the Base Network, have been established in the average distance of 20 to 30km from each other. The eastern and western Azerbaijan and Ardabil (located in north-east of Iran) have shown active faults. For instance, North Tabriz fault shows movement of 7mm per year. The city of Tabriz lies 100km far from this fault. Earthquakes of magnitudes 6 to 7 at the Richter scale have been occurred in this area. Also, recent earthquakes in Roodbar and Ardabil are witnesses to this present fault activity. Twenty-five permanent GPS stations have been used in this zone. On the other hand, Mashhad, Neishaboor and Sabzevar are three cities with high population in Khorasan, which have suffered from heavy earthquakes destroying the whole area and causing huge fatalities. Many active seismic faults, such as Neishaboor, Dasht-Bayaz and KopehDagh, exist in this area. Consequently, twenty-nine permanent GPS stations have been applied in this zone.

- **National Geodetic network**

NCC has established four kinds on national geodetic networks in terms of their order in Iran. The establishment of first order geodetic network of Iran began in 1987. This network consists of 343 triangles covering the entire territory of Iran. Since single frequency GPS receivers had been used and the distances between pairs of stations were above 50 kilometers, Ionospheric error for the whole country of Iran had to be estimated. For this reason, 10 stations with a good distribution were observed by dual frequency GPS receivers and connected to IGS International Network. This connection was accomplished by zero order geodetic network containing 10 stations. Also, the second order geodetic network (2607stations) with the spacing of 20 to 25 kilometer between stations, and the third order geodetic network (4000 stations) with 8 to 15 kilometer distance between the stations were established in order to increase the availability of the stations.

- **Campaign GPS network for geodynamic studies**

Several campaign GPS networks (about 250 stations) have been established during the interseismic period in order to obtain the slip rate of the active faults. These result in better understanding of seismic hazards in Iran. All measurements have been done by dual frequency GPS receiver and choke ring antenna and then processed by Gamit/Globk software.

- **Leveling**

NCC has been responsible for establishing, measuring and maintaining of national leveling networks of Iran for half a century. This is the duty of the leveling section. At the first stage, new specifications for precise leveling were prepared and the first order leveling network was established based on it. Since

then, the specifications have been revised several times and observations of the first (precise) leveling network of Iran have been under progress. First measurements of the network include 98 loops (30500 km) which were carried out from 1981 to 1997 using N3 Wild optical levels. In order to study land vertical movements, NCC started to re-measure the first order leveling network in 2001 which is assumed to be fully completed in 2010. This is being done by implementing new digital levels (DINI 12) and revising the existing specifications to meet the optical-to-digital imposed changes. Ambient temperatures at three different heights along the staffs are also measured to model refraction error and correct the measurements. Also, temperature of Invar tapes is measured to correct the observations for tape expansion. All staffs are calibrated periodically (every 6 month) using an optical calibration instrument and results are used to correct the measurements.

National leveling networks of Iran in three different orders could be used in other projects where precise heights and height-differences from vertical datum are required. Results from repeated measurements show that the precision of the network has been improved. Precise leveling is also used to reveal small vertical movements in Geodynamic and Micro-geodetic projects. Repeated measurements have revealed many subsidence zones during the last few years.

- **Physical Geodesy and Gravimetry**

Nowadays, studying the geopotential and gravity field of the Earth is required to meet many human needs in different disciplines like Mapping, Geology, Petroleum engineering, Surveying, Mining, etc. NCC is responsible for the establishment of gravity networks by collecting, processing and modeling of the required gravity data over the entire territory of Iran. The collected gravity data can be used in many kinds of applications such as:

1- Geoid computation (an ongoing project which is followed by NCC)
2- Converting the leveled heights to Orthometric heights using the observed gravity data along the leveling routes
3- Modeling the structure and density of the crust
4- Studying the underground resources like water, oil, gas, …
5- Improving the global geopotential models
6- Studying sea surface and sea currents in cooperation with oceanography which can be used in climate change studies.

To meet these goals, NCC has designed and established gravity networks in Iran. The zero-order gravity network was established in 2000. This network contains 28 stations where most of them are monumented on bed rocks, and well scattered over the country of Iran. FG-5 absolute gravimeters with 1-2 microgal level of uncertainty were used in this network. The first order gravity network of Iran consists of 700 stations based on a 55 km (0.5 degree) grid spacing all around the country. Gravity measurements are performed by 6 relative gravimeters (3 CG-3M and 3 CG-5) in relative sense between the stations; considering high redundancy for outlier detection. All stations have been precisely leveled with reference to national leveling network stations and measured by dual frequency GPS receivers for 24 hours. The 2nd and 3rd order gravity networks, including 2100 and 22400 stations respectively, were also designed in 2008 in order to obtain a good densification for gravity points. This is absolutely required to precise modeling of the geoid. Establishment of these networks is under progress now, while it is assumed to be completed in 6 years. Each order of these gravity networks is

well tied to the lower order one by relative observations. Gravity networks are also designed to be on regular spacing as possible for homogeneous coverage of the entire country. NCC has also established a national gravity calibration line including 8 stations which are observed by FG-5 absolute gravimeters in absolute sense and used for calibration of the relative gravimeters each year. It is also planned to have geodetic astronomical observations on the first order gravity network stations to better understanding of the potential field of the earth, and geoid.

Photogrammetry

The following nationwide projects are addressed here.

- **Topographic Base Map Compilation at the scale of 1:25,000**

This project was started in 1991 using analogue technology and then switched to digital products. Maps of border areas were produced by using satellite imageries due to the security problems of aerial photography. *SPOT5 HRG* satellite images together with *SPOT5 HRS DEM* have been used in this respect. More than 9600 digital map sheets, covering 95 percent of the whole country, have been produced by the end of Sept. 2009. It is expected that the whole country of Iran will be completed by the end of 2011. It should be mentioned that the country has been divided to about 132 blocks with dimension of 1.5 degree in longitude and 1 degree in latitude.

Besides map compilation, revision of existing maps has already been started and so far some 1300 map sheets have been updated. It should be stated that, the high resolution satellite images now seem very appealing for this purpose.

- **1:2000 Scale Digital Map Compilation for the Cities of the Country**

The demand for reliable and updated large scale maps of cities has been increasing by the governmental and private organizations. NCC is a responsible organization for producing maps of 1026 cities, in cooperation with private sector, in Iran. Digital maps of about 721 cities have been produced so far. It is planned to complete this project within 2 years. Obviously, the updating process has been started during the report period. Total number of 3200 map sheets has been produced by the end of Sept. 2009.

- **Image Maps & Digital Elevation Models (DEMs)**

Thanks to the availability of high resolution satellite imageries coupled with access to fast computers and comprehensive processing software packages, there has been a revolutionary increase in demand for different types of image maps in Iran. For example, more than 130 large and medium scale image mapping projects have been performed by NCC and private companies in 2007.

Digital Elevation Model is a key element of image mapping and remote sensing activities. Hence, a national DEM based on 1:25,000 base map series with 10m resolution has been produced. At present, more than 90 percent of country is covered with these DEM data with height accuracy better than 6 meter. At present time, some programs for improving this data in terms of accuracy and resolution are under progress.

Geo-referenced and geometrically corrected image data are required in order to promote remote sensing activities. For this purpose a pilot project was executed with a full coverage of Landsat ETM+ imageries for the whole country of Iran. It went through a rectification process using 1:25.000 base maps and 10m DEM of Iran. The final products were presented as ortho-rectified 14m PAN and 28.5m multispectral satellite imageries in a block wise manner in 2004.

The next project with the same perspective was started at nearly the same time. This project uses the IRS1C/1D 5.8 m resolution satellite data and the produced map sheets are in the same size of 1:50,000 scale map sheets. About 3000 orthorectified image map sheets have been produced so far.

Geospatial Information System (GIS)

NCC is offering engineering services of various activities, mainly in national level. Basically these activities could be categorized as:

- General Activities
- Producing digital topographic maps and national topographic database
- GIS council Activities
- International Activities

• General Activities

The following activities are mentioned:

- Planning and conducting training courses in GIS and Geomatics,
- Cooperation in the design, development and maintenance of GIS and spatial databases based on geodatabase technology. "Implementing urban geodatabase for Qom", "national specific geodatabase for resources and watershed management", and " assessment and database modeling of urban geodatabase for Khorramabad and Sanandaj " are few examples in this respect,
- Cooperation in providing necessary standards and procedures to be implemented on GIS projects and spatial databases.

• Producing digital topographic maps and national topographic database

The advantage of having topographic maps shows a remarkable improvement to obtain geographic information. In order to achieve this , the following projects have been accomplished:

- Digital topographic map production at 1:25000 scale. which is accomplished by the department of photogrammetry
- National Topographic Database (NTDB). NCC decided to create National Topographic Database of the country based on above mentioned 1:25000 base maps. The first step was to design and standardize this database and then applying necessary changes to the production line. The NTDB standard was published in 1994 and the database was created at the same time. The early version of NTDB was produced in a sheet wise mode and then stored in a file-based style. The second version was produced in a block wise mode and then stored in ESRI's Shape file format.
- National Geodatabase. Based on the Shape file format of NTDB, NCC has started this project. In addition to 1:25000 map sheets, the national geodatabase contains other data such as Landsat ETM+ imageries or data from Geological survey of Iran. Hence, a user seamless database which is accessible for different organizations based on interoperability concepts is developed. The National geodatabase can be accessible through the Web Map Server. The users from different locations in Iran are able to browse the spatial data maintained in the geodatabase server and download the desired data through web browser. Table 1 represents the progress of producing NTDB by the end of Sept. 2009.

Product Name	Quantity
NTDB	8347 Sheets
NTDB in ESRI's Shape file	99 Blocks
NGeodatabase	96 Blocks

Table 1- The progress of TDB products by the end of Sept. 2009

- Derived Maps from 1:25,000 scale base map. Quite number of derived maps have been produced at different scales of 1:50,000 , 1:100,000 , 1:250,000 from 1:25,000 scale digital base map. Table 2 represents number of maps produced by the end of Sept. 2009 in this respect.

Scale of the derived map	No. of maps produced by mid-2009
1:50,000	2100
1:100,000	430
1:250,000	80

Table 2- No of derived maps by the end of Sept. 2009

- Digital Large Scale Maps for Cities. As it was explained in the department of photogrammetry.

• GIS Councils Activities

In 1994, NCC established National Council of GIS users (NCGISU) in an effort to introduce capabilities of digital maps and geospatial information systems to users. This council is a major active body to make effective measures in promotion of awareness of GIS users in national level and also to organize and harmonize different activities in design and development of a National GIS. Director of NCC is chairperson and GIS manager is acting as secretariat of this council. This Council consists of representatives of 22 different ministries and organizations which are acting in GIS.
Necessary actions are taken based on requirements collected from users. The council has a regular monthly scheduled meeting and relevant issues are discussed in these meetings. Six different technical committees have been operated under supervision of this council. These committees are as follows:

- Geospatial feature coding
- Urban GIS
- policy for underground facility management and mapping
- policy for Geospatial Information Exchange
- policy for administrative boundaries
- policy for use of Open source GISs

These result in development of private sectors so that the number of governmental contracts with private companies have been increased. Consequently, Provincial Council of GIS Users (PCGIU) has been established in 30 Iranian provinces under NCC's supervision to conduct and coordinate GIS related activities. A number of urban and regional projects have been approved by these councils. "Urban Geodatabase for Qom " is an example.

- **International Activities**

In order to maintain foreign relations with regional and international institutions, experts and cooperate with them, NCC has been involved in the following well known regional and international activities:

- Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP): In this committee NCC played the role of chair of Working Group 2 (Regional fundamental data) and executive board member from 1994 to 2006.
- United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP): This conference is held once every three years in one of the regional countries and members of PCGIAP executive boards are selected during these meetings.
- International Steering Committee for Global Mapping (ISCGM): Iran is a permanent member of this committee. The global map of Iran has been recently published and it is accessible through ISCGM web site (www.iscgm.org).

Cartography

The following tasks are accomplished here:

- **Production of National Atlases**

According to the assignment dated June 1992, National Cartographic Center is responsible organization for production and revision of the National Atlases in Iran. After fulfillment of the Iranian National Atlas project in December 2001, continuous updating of these atlases became the part of NCC's responsibilities.
Therefore, several atlases were scheduled for revision due to the newly collected statistical data. Nine atlases have been revised and published since the beginning of the revisions in 2002. They are: Geology, Health, Energy, Agriculture, Higher Education, Industry, Animal Husbandry, Fishery, and the General Atlas of Iran. The General Atlas of Iran is an abstract of the all of the mentioned atlases. Nowadays, revised atlases are published both in paper and digital forms. They are represented on CDs and also prepared for publishment on the web site of NCC. These atlases are in Persian language and there were no public inquiry in other languages.

- **Thematic Mapping**

Due to the increase of map users, different types of the maps are being produced in Iran. These maps are mostly published by private sector. Companies with different backgrounds are publishing thematic maps due to the growth of users for the thematic maps. Therefore, a lot of efforts must be done to prevent low quality maps to be delivered to the users by supervising on the production process carefully. National Cartographic Center according to its responsibilities encourages companies for production of high quality thematic maps. City maps and tourist maps are the most required maps by public users, whereas statistical maps have also gained a great consideration by decision makers.

- **National Geographical Names Database**

Since 2000, National Cartographic Center has been assigned to establish Iranian National Committee for standardization of the Geographical Names (INCSGN). In fact, INCSGN has been organized to congregate and harmonize all activities for standardization of geographical names and has successfully taken necessary steps. One of its main tasks was establishment of the National Geographical Name Database as an official authority for geographical names.
This database is operational and accessible via World Wide Web (geonames.ncc.org.ir). Various search methods have been provided in the site to promulgate registered names.
This site is in Persian language but the database has been furnished with possibility of searching in English alphabet. In the near future, the English version of this site would be available.
Above 100000 names have been included in the Iranian National Geographical Name Database which covers more than 150000 features.

- **Printing House**

All activities related to reproduction of the paper based productions, such as copying, prepress, and offset press are accomplished in this section. NCC`s Printing house is equipped with the latest

technology for digital scanning and color separation. It also has four offset printing machines which enables NCC to execute huge offset printing projects.

- **3D maps**

These are among the first products of NCC since its establishment. These maps are small scale topographic maps which are made by hand. By equipping to the latest laser technology, some steps of this production line have been automated recently. A dramatic progress has been made on 3D map production by improvements in moulding techniques alongside this laser possibility.
These maps are available in frames with a greater durability.

- **International Activities**

Since 1995, NCC is formal representative of I.R. Iran at International Cartographic Association (ICA). Since then NCC has participated in all map exhibitions which are held by this association and it is proud of winning world quality product for one of its Atlases that was shown in the past ICA exhibition.
The NCC representatives have attended in most of scientific commissions of the association during ICA conferences. Also several common training courses have been delivered in cooperation with ICA in NCC.

- **United Nation Group of the Experts in Geographical Names (UNGEGN)**

In 2000 NCC was assigned by government of Islamic Republic of Iran to establish Iranian National Committee for standardization of the Geographical Names (INCSGN). Two main purposes are followed in this respect. The first aim is to support experts inside Iran who have been working on the above mentioned National Geographical Name Database. Second , to communicate and fulfill national responsibility according to the United Nation projects, specifically UNGEGN. Several working groups have been arranged to support necessary documents for presentations in UNGEGN conferences every 2 years. They also decide on ongoing problems related to different fields of Geographical Names which are subjects of discussions at UNGEGN General Assembly in every 4 years.
The director of NCC is Chair of Iranian National Committee for standardization of the Geographical Names (INCSGN) and the Cartographic Department is secretariat office to the committee.

Hydrography

Nautical information including nautical charts, tide tables, and…. are being provided as follow:

- Sea survey for producing nautical charts
- Tide and tidal stream research

There is no doubt that the provision of accurate and up to date charts offers significant economic and commercial benefits through facilitation of maritime trade and other marine activities.

The history of hydrographic activities goes back to 1977, when a contract for hydrographic surveying of Iranian waters was signed between Iran & U.K. At that time, there were Admiralty charts with bathymetric data of 40 to 100 years old. In 1983, UNDP evaluated the possibilities of different organizations to be established as the hydrographic center in Iran. Then, NCC was recognized as a fair potential for the Iranian government in this respect. Accordingly, the department of hydrography was established in NCC in 1984.

The department of hydrography planned to publish the charts for the entire coast of Iran within the Persian Gulf and Oman Sea. INT charts were also planned to be published accordingly. Deep sea surveys were also planned. All surveying activities are maintaining the requirements of IHO standards for the hydrographic surveys. As a national coordinator of Navarea IX, navigational warnings are timely promulgated in the area of jurisdiction.

For safer shipping, ENC set has been established and efforts are concentrated to produce ENC in near future.

The mission of the Iranian Hydrographic Department is to ensure the provision of adequate and timely hydrographic information for nation-wide and international marine navigation and other purposes, through the co-ordination of the national hydrographic committee.

The main objectives of the department are as follows:

- Co-ordination of the activities of national hydrographic activities;
- Uniformity in national nautical charts and documents;
- Co-operation with IHO and neighboring countries.

And for the time being, the following hydrographic projects are being undertaken;

- 1:25000 and larger scale
- 1:100000 scale

Here is the list of facilities & equipments exist in this department:

Vessels: IRAN ABNEGAR, with the following specifications:
Length: 34.20 m
Width 8 m
Draught 2.75 m
G.R.W. 305 tons, N.R.W. 91 tons
Crew and hydrographic staff 16
Fuel capacity 70 tons
Water capacity 50 tons

Ability of 15-21 days sea voyage

- 6 Small boats from 7 to 13 meters length

Position fixing instruments:

- Single & Double frequency GPS,DGPS.
- Motion sensors.

Sounding instruments:

- Single beam echo sounders.
- Multibeam echo sounders.
- Seabed classificator (Roxann).

Oceanographic Sensors ;

- Mechanical tide gauges
- Electronic tide gauge
- Electronic Sea bed tide gauges
- C.T.D sensors
- Bathy termograph sensors
- Current meters
- Sea bed sampler

Software ;

- Gathering hydrographic data software (Hypack)
- Processing position fixing soft wares
- Processing hydrographic data software
- CARIS GIS software for preparing digital charts
- Digitizing tidal data software
- Processing tidal data software
- Tidal prediction software

www.iranhydrography.org

New charts & updates:

ENCs: about 45 ENC charts have been produced.

INT charts as follows:

National chart PG 3001	INT 7208
National chart PG 3010	INT 7207
National chart PG 3017	INT 7305
National chart PG 3021	INT 7302
National chart PG 3031	INT 7306
National chart PG 3040	INT 7207

National paper charts including:

26 paper charts were produced between 1989 and 1998
130 digital charts were produced between 1998 and 2009
And about 30 digital charts are under production.

Training

To promote the technical knowledge of staff, different courses have been carried out at the department of hydrography. They have attended and undertaken the training courses of hydrography & nautical cartography in India, Japan, Italy, and ENC Production in UK.
The department has also been in cooperation to establish Msc. Courses of hydrography in Tehran University and scholarship to 6 students was granted.

Tide gauge network

This network contains 10 tide guage stations which are specified in the following table:

NO.	Places	Lat. (N)	Long. (E)	Establishment Date
1	KHORRAMSHAHR	30 25	48 12	2001
2	BANDAR-E EMAM KHOMEINI	30 26	49 05	2001
3	BANDAR-E EMAM HASAN	29 50	50 15	1989
4	JAZIREH-YE KHARK	29 16	50 20	2001
5	BANDAR-E BUSHEHR	28 59	50 50	1989
6	KANGAN	27 50	52 03	1989
7	BANDAR –E LENGEH	26 33	54 53	2004
8	BANDAR-E SHAHID RAJAEE	27 06	56 04	1990
9	JASK	25 39	57 46	1998
10	CHABAHAR	25 17	60 37	1995

Research and Planning

- **Standardization**

In general, the Institute of Standards and Industrial Research of Iran (ISIRI) is the authority for national standards, and represents the I.R. Iran at the International Organization for Standardization (ISO). On the other hand, National Cartographic Center (NCC) is the main authority for standardization of maps and spatial information under the I.R. President's Deputy for Planning and Strategic Supervision. NCC and ISIRI cooperate with each other on related subjects.

At the international level, mirror committees are established under ISIRI to cooperate with corresponding ISO Technical Committees. NCC is secretariat of ISIRI/TC211, which is the Iranian mirror technical committee that cooperates with ISO/TC211 (Geomatics/Geospatial Information). Iran is currently an O-Member (Observer) of this committee.

At the national and sector levels, standards are developed through NCC's Standards Committee for Digital Spatial Data. This is accomplished with the participation of specialists from different sectors (government, private sector, academia …) and is based on user needs reflected by the National Council of GIS Users. Based on their scope and degree of consensus, these standards and specifications can then be ratified by ISIRI for national status.

These standards and specifications can include modeling, acquisition, processing, presentation, management and transfer of spatial data for different scales.

A list of standards and specifications that have been developed or are under development in the framework of the “Unified Specifications for Surveying and Mapping” are as follows:

- Volume 1: Geodesy and Leveling
- Volume 2: Photogrammetry (General)
- Volume 3: Geospatial Information Systems -GIS (General)
- Volume 4: Cartography (General)
- Volume 5: Microgeodesy
- Volume 6: Gridded and Raster Data
- Volume 7: Digital Topographic Mapping at 1:500 Scale
- Volume 8: Digital Topographic Mapping at 1:1000 Scale
- Volume 9: Digital Topographic Mapping at 1:2000 Scale
- Volume 10: Digital Topographic Mapping at 1:5000 and 1:10000 Scales
- Volume 11: Hydrography

In addition to the documents stated above, NCC has also developed standards and specifications for:

- Gravimetry
- Digital Topographic Information at 1:25000 Scale
- Digital Topographic Image Maps at 1:50000 and 1:100000 scale
- Digital Topographic Maps at 1:250000 scale.

- **Research**

Research and development in the field of Geomatics Science and Engineering are conducted in three domains: fundamental, application and development. The following objectives are investigated:

- expanding the borders of knowledge,
- establishment of new technology,
- better understanding of the natural phenomena, and
- Improving and innovating methods, products and instrumentation.

NCC's Research Council is acting on setting policy, guidelines, objectives, plans, and approving publications and research projects.

To keep abreast with scientific and technological advancements in Geomatics, continuous communication between the main Geomatics organizations and academia (domestic and foreign) exist. NCC supports domestic MSc and PhD thesis in the field of Geomatics, both financially and morally, in the framework of joint research projects.

A national Geomatics Conference and Exhibition is held by NCC each year in May, which creates an opportunity for scientific discussion and presentation of latest developments. We hope that this will assist in thriving the Geomatics discipline and that the results of these researches (maps, spatial information and their optimum usage) will help to improve mid- and long term national planning.

- **Planning**

Making NCC's policies, strategic directions and goals, are the responsibility of this section, with the participation of NCC management.

Short- Mid and Long- term objectives are then determined with the cooperation of different departments. Achievement to these objectives is measured and controlled to supply feedback for the management process.